AN INVESTIGATION INTO HEALTH AND SAFETY MANAGEMENT BY SMEs AND THE RISK OF CORPORATE MANSLAUGHTER PROSECUTION

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Abstract

The construction industry is consistently considered one of the most dangerous industries in the United Kingdom (UK) and the rest of the world due to reported work-related fatalities and injuries. The majority of these incidents are attributed to Small and Medium Enterprises (SMEs) as they perform a significant role in the UK construction supply chain. There is a common belief that safety performance in these types of organisations is strongly linked to the effectiveness of the implementation of safety management systems. Whilst the industry has made an outstanding effort to improve health and safety (H&S) practices, there are some areas which still need refinement. The legal system is one of the approaches considered for the improvement of H&S management in the industry. The Corporate Manslaughter and Corporate Homicide Act 2007 (CMCHA) was passed with the intention of improving the law on corporate criminal liability for poor H&S management. Since the Act came to force in 2008, over 30 percent of the convictions are attributable to the construction industry. Interestingly, all convictions for corporate manslaughter are attributable to SMEs. This therefore suggests that the size of the company is a major factor in the degree of exposure to corporate criminal liability. Since SMEs are labelled as risky in terms of exposure to hazards and death in the workplace, it is of importance to investigate their H&S management practices. However, not much attention has been given to the way SMEs manage H&S in the working environment and how they are influenced by recent H&S regulations.

This study employed a mixed methods approach over two stages to investigate the level of implementation of the basic elements of a Plan-Do-Check-Act (PDCA) H&S management system UK construction SMEs and assess to what extent they were aware of the legal obligations towards their employees. The study also seeks to explore how the CMCHA influences their management activities. The first stage conducted a questionnaire survey to gather relevant data from construction SMEs in the UK. From the analysis of data, it was found that these types of organisations are currently implementing, albeit to a certain level, a structured health and safety management system in the workplace. However, there was evidence of a lack of balance between the different stages of the PDCA cycle, showing potential room for improvement. This research revealed that SMEs should put more attention into seeking a fair balance between H&S, time, cost and quality as well as involving workers in H&S matters and monitoring ill-health. There were also causal interactions between the implementation of a H&S management system in SMEs and the level of awareness of their duties of care to their employees and persons other than employees. Furthermore, it was concluded that the CMCHA had *'some'* influence in the way SMEs manage H&S. During the second stage, the study looked further into these results by conducting interviews to experts in the senior management level of SMEs. Findings from this stage added that morality and the wellbeing of the employees is one of the main factors that drive SMEs to improve their safety performance. Interviewees highlighted that significant change is yet to be seen from the CMCHA as prosecuting large organisations remains a challenge.

In the view of the findings, organisations should devote resources to orientate and motivate their senior level to improve their H&S management systems in respect of the flaws identified. It is also important that they monitor their H&S practices, thus it would be possible to identify possible areas of improvement and ensure compliance with legislation.

Glossary of Words

Absenteeism	-	Absence or non-attendance
Act	-	Law that both Houses of Parliament have agreed to and which has received Royal Assent
Brexit	-	The withdrawal of the United Kingdom from the European Union
Causal	-	Acting as a cause
Convergence	-	When two or more things come together to form a new whole
Fairness	-	Just and impartial treatment without favouritism or discrimination
Ill-health	-	Condition of inferior health in which some disease or impairment of function is present
Implementation	-	Process of putting a plan into effect
Impressionistic	-	A style that seeks to capture a feeling or experience
laissez-faire	-	French expression for the unwillingness to getting involved in
Manslaughter	-	Crime of killing a human being without malice
Morality	-	Principles concerning the distinction between right and wrong behaviour
Occupational	-	Relating to a job or occupation
Pluralistic	-	Relating to a system of thought that recognises more than one ultimate principle
Postmodern	-	Ideology characterised by subjectivism or relativism
Single reality	-	Philosophical term to express that the truth is only one and measurable

List of Abbreviations

BERR	Department for Business Enterprise and Regulation Reform
BIS	Department for Business, Innovation and Skills
BS	British Standards
BSI	British Standards Institution
CDM	Construction (Design and Management) Regulations
CIB	Conseil International du Bâtiment
CITC	Construction into the Twenty first Century
CMCHA	Corporate Manslaughter and Corporate Homicide Act
CPS	Crown Prosecution Service
CSCS	Construction Skills Certification Scheme
EU	European Union
EC	European Commission
GVA	Gross Value Added
H&S	Health and Safety
HSE	Health and Safety Executive
HSWA	Health and Safety at Work Act
ILO	International Labour Organization
IRA	Inter-Rater Agreement
INDG	Industry Guidance
ISO	International Organization for Standardization
LFS	Labour Force Survey
ONS	Office for National Statistics
OHSAS	Occupational Health and Safety Assessment Series
OHSMS	Occupational Health and Safety Management System
PDCA	Plan-Do-Check-Act
POPMAR	Policy, Organising, Planning, Monitoring, Audit and Review
PPE	Personal Protective Equipment
RIDDOR	Reporting of Injuries, Diseases and Dangerous Occurrences Regulations
SGC	Sentencing Guidelines Council
SME	Small and Medium Enterprises (or Small and Medium-sized Enterprise)
USA	United States of America
UK	United Kingdom

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Dedication

This dissertation is dedicated to my family. Their sacrifice, unconditional support and constant love have sustained me throughout this journey.

Acknowledgments

First and foremost, I would like to express my deepest gratitude to my director of studies, Prof. Issaka Ndekugri, for the inspirational guidance and patience throughout the period of this research. Without his advice and understanding, this PhD thesis would have not been completed. My heartfelt gratitude also goes to my supervisor, Dr. Nii Ankrah, for his wonderful supervision, mentoring and encouragement throughout this journey, and for giving me the confidence to write this thesis.

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List of Publications

Perez, P. A., Ndekugri, I. and Ankrah, N. (2017) A critical review of convictions of construction industry organisations under the Corporate Manslaughter and Corporate Homicide Act, In *Joint CIB W099 & TG59 International Safety, Health, and People in Construction,* 11-13 June 2017 Cape Town.

*Perez, P. A., Ndekugri, I. and Ankrah, N. (2019) The implementation of health and safety management systems: an evaluation of SMEs in the UK construction industry. Safety Science

*Perez, P. A., Ndekugri, I. and Ankrah, N. (2019) Enhancing health and safety management in construction SMEs: Drivers and barriers. Journal of Safety Research.

**Hampton, P., Perez, P.A., Stuart, R. and Young, N., 2018. Using Energy Interventions to Drive Down Energy Consumption. *Conference on Construction in the 21st Century (CITC-Committee).* 5-7 March 2017 Dubai.

*These publications are pending submission.

** This publication is not directly related to the research reported in this thesis, but was a result of the overall research training and was developed and published during the study period.

Chapter 1: General Introduction

1.1 Introduction

The construction industry is consistently considered one of the most dangerous industries in the UK and the rest of the world due to the reported and non-reported work-related fatalities and injuries. Although statistics evidence the steadiness of a downtrend in the occurrence of accidents over the last decade (HSE, 2015), the construction industry still accounts for a significant number of deaths, injuries, dangerous occurrences and work-related illnesses every year. These health and safety (H&S) outcomes take place in all sorts of organisations regardless of their size, location or type of work undertaken. Therefore, H&S has become an important subject for the over two million construction employees involved within the sector (ONS, 2016) and for the wider society.

The legal system has been one of the areas where changes have been made over the years towards improvements in health and safety outcomes. The introduction of the Health and Safety at Work Act 1974, the Corporate Manslaughter and Corporate Homicide Act 2007 (CMCHA) and other regulations (e.g. the Construction Design and Management Regulations (CDM 2015)) have helped the Health and Safety Executive (HSE) to prosecute individual offenders and organisations for failures in H&S management.

Available data on prosecutions show that frequently, Micro, Small and Medium-Sized Enterprises (SMEs) are vulnerable to such prosecutions. This has led academics, practitioners and authorities to pursue a range of research activities to develop in-depth understanding of: (i) what makes these types of organisations more susceptible to adverse safety incidents; (ii) the current H&S commitment of such organisations; and (iii) whether the recent legal developments have made an impact on their compliance with the health and safety requirements of the construction industry.

It is in furtherance of this agenda that this study finds answers to how organisations are currently implementing a H&S management system within the construction industry and whether legislation is a major driver in assuring safe systems of management. The study is situated within the context of construction SMEs in the UK and explores the commitment of such organisations to the implementation of a structured H&S management system. In addition, the study also looks at the impact of legislation, particularly the CMCHA, on their management practices.

This first chapter provides an overview of the research. It presents the research background and justification, key research questions, and the aim and objectives. This is then followed by the scope of the study, the research design and the contribution to knowledge. Lastly, an outline of the way the thesis is structured is provided.

1.2 Research Background and Justification

1.2.1 The importance of health and safety in the workplace

Life is considered a precious gift and therefore, should be of significant importance in every task involving human activity. Unfortunately, an unacceptable number of people die from injuries and ill-health occurring at the workplace for centuries. It is an individual responsibility to take care of your own health and safety but, under UK law, it is also the duty of employers to ensure the health, safety and welfare of their employees and that of members of the public who may be affected by their actions at work. In some of the worst-case scenarios, even children are killed by management failures in the working environment (Sawacha, Naoum and Fong, 1999). Organisations are also driven to manage health and safety effectively due to the unwanted cost that accidents may incur, such as fines and costs from prosecutions, insurance, cost of investigations, damage to buildings and equipment and the cost from disruption of construction processes and delayed progress (Hughes and Ferrett, 2016). Indeed, over and above such cost, is the social cost and reputational damage caused by the occurrence of accidents.

As an attempt to eliminate the risk of accidents, health and safety has become a recurring theme amongst industries, businesses and commerce (Hughes and Ferrett, 2008) as they have worked assiduously on the improvement of the performance of H&S throughout the years. In fact, statistics show that there has been a significant reduction in the number and rate of injuries in the past 20 years in the UK (HSE, 2018). This has positioned the UK amongst the lowest accident rates in Europe and the world (HSE, 2016a). However, a *zero accidents* vision dictates that there will always be room for improvement in the management of health and safety until accident-free workplaces are achieved (Zwetsloot et al., 2013).

1.2.2 The poor health and safety performance of the UK construction industry

The construction industry is, unquestionably, one of the main contributors to economic growth across the world and has strong linkages with other sectors (Osei, 2013); but it is considered one of the most dangerous industries due to the hazardous nature of its activities. Although the industry has made an outstanding effort to minimise accidents, statistics show that further measures are necessary. Accounting for an average of 41 fatalities and 60,000 injuries per year (HSE, 2018), the UK construction industry shows an unfavourable performance when compared to the other sectors. These H&S outcomes impose a huge cost on the industry (Pearce, 2003), and for the over two million construction workforce (ONS, 2016) all of whom are at risk, and indeed the wider society, this is clearly unacceptable.

The poor safety performance of the construction industry gives an international concern on the development of health and safety (Haslam, et al, 2005; Lopez Arquillos, et al 2012). Therefore, the intention to deliver improvements through identifying the main causes of accidents has been the main objective of many studies focused on H&S (Abdelhamid and Everett, 2000; Haslam, et al, 2005). As remediating actions, many of these studies had concluded on performing preventing actions on site and in the pre-construction stages of a construction project, but accidents are still likely to occur. The H&S performance of the construction industry is now commonly linked to the efficiency of the management strategies implemented within organisations (Hughes and Ferret, 2011; Gopang et al, 2017). Consequently, organisations that have strong H&S leadership and management strategies are perceived to have better H&S performance, whereas those with weaker management strategies are deemed to be the cause of the industry's poor reputation. Significantly, this has led to an association of Small and medium sized organisations (SMEs) with poor H&S management. Many of which have been accused of having difficulties in managing health and safety effectively and in complying with regulations, as they have accounted for nearly 80% of non-fatal injuries in the workplace for the last ten years (LFS, 2016) and in some cases for 90% of fatal accidents (Phillips, 2011). Considering that SMEs inevitably play a significant role in the UK construction industry, it is necessary to explore how SMEs are currently managing health and safety and whether this satisfies the requirements prescribed by standards and regulations.

1.2.3 The UK H&S law and the Corporate Manslaughter and Corporate Homicide Act (CMCHA)

There has been a historical policy in the UK to promote desirable health and safety outcomes by a combination of legislation and the common law. This makes the legal system one of the areas where changes have been made over the years towards improvements in health and safety outcomes. Health and safety legislation in the UK was for a long time reactive rather than proactive, and tended to be designed for particular industries or specific types of workplaces (Hughes and Ferret, 2011). This caused many workers to be exposed to unacceptable risks at the workplace without a definite solution to prevent accidents. Fortunately, this protracted problem led to a comprehensive review of health and safety legislation and eventually the enactment of the Health and Safety at Work Act in 1974, which marked the beginning of an era in the management of health and safety. The Act has been effective in reducing accidents although it does not impose criminal sanctions to organisations for causing fatalities. This means that an organisation had to be prosecuted under the common law for gross negligence manslaughter to be punished for causing the death of an employee.

Public reaction to failures to achieve manslaughter convictions against any company after a long string of high profile disasters involving massive loss of human life, such as the Herald of Free Enterprise (1987), King Cross Fire (1987), Piper Alpha Oil Disaster (1988) and the Marchioness Disaster (1989), was one of great outrage that big business and directors were getting away with "murder" (Home Office 2000; Wells

2006; Harris 2007; Ormerod and Taylor 2008; Ndekugri 2011). Views were expressed that the health and safety problem was not being taken seriously enough in boardrooms and that no amount of legislation would make any impact unless it addressed such *laissez-faire* corporate attitudes to health and safety issues. The Law Commission reported in 1996 that a new offence of manslaughter needed to be created for corporations. Parliament eventually passed the Corporate Manslaughter and Corporate Homicide Act, 2007 (CMCHA), which came into force on 6 April 2008. Since then, there have been twenty-one (21) convictions, with the construction industry accounting for 33 percent (Perez, Ndekugri and Ankrah, 2017). All these convictions for corporate manslaughter were attributable to small and medium enterprises (SMEs) confirming that the size of the company is a major factor in the degree of exposure to corporate criminal liability, but even more importantly the quality of H&S management at corporate level.

1.2.4 Research justification

From the above, it is clear that construction SMEs are currently in a difficult situation when looking at their health and safety performance. This creates the need to build an understanding of their actual commitment to health and safety management and provide recommendations that would lead to a reduction of incidents and accidents.

From an academic perspective, there has been a vast amount of research on accident prevention. Among the findings, research on health and safety has concluded that there is an inverse relationship between business size and occupational accidents. Surprisingly, most academic research about health and safety management are viewed from the practice of large construction firms (Arewa, 2014), even when it has been evidenced that large organisations manage health and safety "as good as it can get" (*ibid*). On the other hand, research focused on SMEs is rather limited which hinders understanding of their implementation of a safety culture.

Among the authors concerned about construction SMEs, Arewa and Farrell (2012) argued that the need to invest in health and safety makes more economic sense to large organisations when compared to SMEs. This is due to fears that compliance with health and safety regulations will not enhance the profitability of SMEs (HSE, 2005; Sampaio, Saraiva and Domingues, 2012).The poor safety performance of SMEs has been also linked to the lack of knowledge of health and safety risk (Champoux and Brun, 2003), lack of involvement of the workforce in safety matters and lack of commitment to a structured safety system (Arocena and Nunez, 2010). However, there is no empirical evidence of whether SMEs implement a management system to comply with the health and safety requirements as suggested by Gopang et al. (2017) and the HSE (2013d). The gaps above therefore indicate a need to understand the implementation level of a health and safety management system in construction SMEs and how the legal system influences their safety practice.

From the above discussion, the fundamental research questions which need answering in order to bridge the knowledge gaps are:

- Do construction SMEs implement management systems to improve their health and safety performance?
- Are construction SMEs aware of their basic duties of care to their employees?
- To what extent does the offence of corporate manslaughter influence the way construction SMEs manage health and safety?

1.3 Research Aim and Objectives

The aim of this study is to analyse the influence of the corporate manslaughter legislation on the management of health and safety by SMEs in the UK construction industry and investigate areas of possible improvements.

In order to achieve the stated aim, the study seeks:

- OB1. A critical examination of the literature to develop an understanding of the importance of health and safety in a work environment and the management and legal framework behind the procedures and practices applied in the UK;
- OB2. Undertake a critical review of the structure of SMEs in the UK and their health and safety performance in the construction industry;
- OB3. To determine the awareness of the health and safety duty of care owed by the directors or owners of construction SMEs to their employees, particularly the risk of prosecution under the Corporate Manslaughter and Corporate Homicide Act;
- OB4. To investigate how construction SMEs are currently implementing occupational health and safety management systems at a senior level;
- OB5. To design, discuss and develop a model of relationship between variables assessed in the study regarding an effective safety culture;
- OB6. To critically evaluate the on-going influence of the Corporate Manslaughter Act in the way construction SMEs manage health and safety in the workplace.

1.4 Scope of Study

The focus of attention of this research is on the senior management level of the administrative hierarchy of micro, small and medium (SMEs) construction organisations, as they constitute those with influence in the H&S decision-making process. They are also most likely to be liable for any health and safety offence occurring in the workplace. However, the inclusion of large organisations could help to document a different perception of the research problem. It focuses on construction organisations based across the UK to ensure that findings reflect the general trend across the UK. Furthermore, this study is also focused on the corporate manslaughter offence as described in the Corporate Manslaughter and Corporate Homicide Act 2007.

1.5 Research Design

From the research problem and the set objectives, it can be assumed that a positivist worldview is the most suitable approach to be adopted. However, the research has opted not to view the management of health and safety and the influence of the corporate manslaughter legislation on SMEs as a "single reality". The incorporation of phenomenological elements to provide alternative insight into the phenomenon of the actual impact of the law in organisations, defines this research as a pragmatic approach. This resulted in a mixed method where a quantitative inquiry is followed by a qualitative inquiry (Creswell, 2014). The intention is to explore in a quantitative manner to learn about the perception of the population as a whole regarding the phenomenon and, subsequently, validate the findings in a qualitative manner.

In order to understand the research problem, the research carried out a literature review as the first step of the methodology. This review addressed the importance of health and safety in the UK construction industry and the participation of SMEs. It also provided an explanation of the new offence established by the Corporate Manslaughter and Corporate Homicide Act, its background and how it has performed throughout the 10 years it has been in effect.

The literature review led to the development of a basic conceptual management framework for health and safety best practice in organisations and a measuring framework relating to the issues defining the knowledge gap. Construction SMEs were then approached to determine the level of implementation of an occupational H&S management system by using questionnaires as instrument distributed to a random cluster sample within the UK. Secondly, it was intended to determine whether the directors or owners of the SMEs were aware of the duties of care they owe to their employees during the time they are working for them and to persons other than employees. Furthermore, it was necessary to find out whether the new corporate manslaughter Act had any influence on the way SMEs are currently managing the health and safety decisions and plans. The study analysed the data using descriptive and inferential statistics to determine whether there is a relation or common factor between the variables identified.

In addition to the questionnaires, telephone semi-structured interviews were conducted as a second phase to obtain in-depth information from construction SMEs. The interviews followed a schedule designed to address the areas which the researcher considered necessary to emphasise on in order to achieve the objectives of the study. These included validation of significant findings of the qualitative analysis and additional comments on the research problem. A diagram of the research process is presented in Figure 1-1.

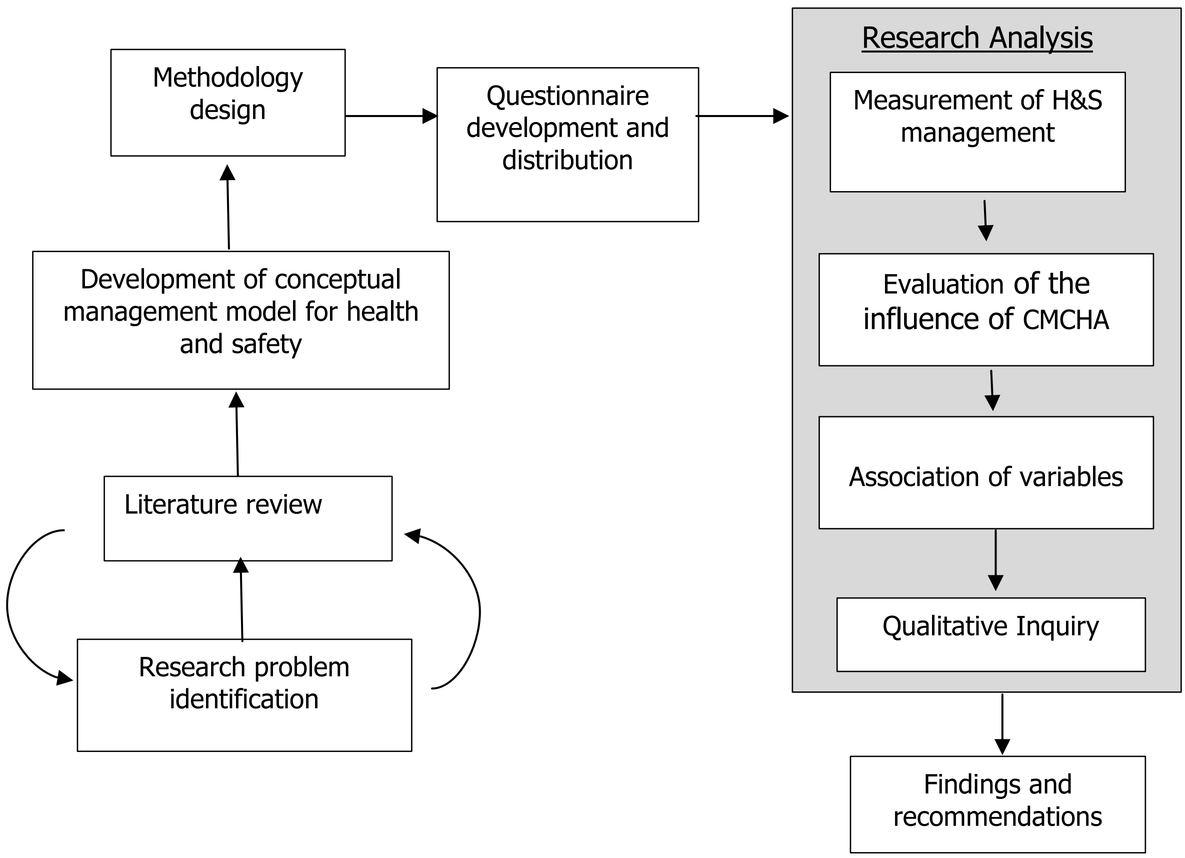

Figure 1-1. Overall research process

1.6 Contribution to Knowledge

This research has provided new insight into the management of health and safety in small and medium organisations (SMEs) in the construction industry, revealing how they are currently implementing health and safety management systems and how current legislation influences the implementation of a good health and safety practice, in particular the Corporate Manslaughter and Corporate Homicide Act.

Regarding the management of health and safety, this study has made significant contribution by evidencing that overall, SMEs are currently carrying out the tasks that comprise the structure of a management system. This however does not indicate that these types of organisations are implementing them effectively. This research also provided contributions on the different actions implemented by SMEs on each of the stages of the Plan-Do-Check-Act cycle. Moreover, the overall assessment unveiled a lack of continuity along the implementation of the system, which suggests that there is considerable room for improvement in the way SMEs manage H&S.

This study also made a contribution by providing a tangible measure of the level of awareness of employers' legal duties to their employees and persons other than employees. This measurement revealed that SMEs directors or employees in the senior management level have a good understanding of their legal obligations towards the safety of their employees and persons other than employees. Another significant contribution was that the potential consequences of being prosecuted for health and safety offences, such as fines, imprisonment, reputation and disqualification are indeed factors with high impact in enhancing the implementation of a good H&S practice amongst SMEs.

The study has also provided empirical evidence that the level of implementation of an occupational health and safety management system in construction SMEs is influenced by the level of awareness of the employers' duties of care to their employees and persons other than employees. If a causal relationship can be established, this can be used as a basis for enhancing the safety performance in construction organisations. In addition, this study has provided confirmation that the financial status of SMEs is linked to the management of health and safety.

In relation to the Corporate Manslaughter and Corporate Homicide Act (CMCHA), the contribution of this study is that this Act has led to some improvements in the way SMEs manage H&S. However, the findings also suggest that the Act has made little impact on the impediments against the prosecution of large organisations for corporate manslaughter.

Overall, considering the fact that small and medium organisations represent the vast majority of the construction supply chain in the UK, this research provides insights that could potentially lead towards achieving a safer construction industry.

1.7 Structure of the Thesis

The thesis consists of ten (10) chapters, organised as shown in Figure 1-2.

Chapter 1 outlines the context within the research is undertaken, and also presents the aim and objectives of the research, the scope of the research, the research design and then the main contributions of the research to knowledge.

Chapter 2 presents a review of the literature focused on the role of the UK construction industry as an economic sector and its health and safety performance. It also highlights the challenges and efforts to improvement. In particular, this chapter seeks to highlight the health and safety performance deficit that exists in small and medium organisations (SMEs) and their lack of commitment to regulations.

Chapter 3 continues the literature review by defining the concept of management and how it is applied to health and safety in the construction industry. It also establishes how the size of an organisation can affect the adoption of H&S management plans emphasising in the current challenges for implementation.

Chapter 4 presents a general review of the H&S legal system in the UK, and in particular the background, enactment and effectiveness of the Corporate Manslaughter and Corporate Homicide Act 2007, focusing in the construction industry.

Chapter 5 presents an outline of the research methodology adopted for undertaking this research. This chapter presents the arguments that justify the choice of an explanatory sequential mixed method approach and the specific research methods applied to collect data.

Chapter 6 presents the findings and discussion of the quantitative inquiry relating to the measurement and discussion of the level of implementation of an occupational health and safety management system in construction SMEs and the level of awareness of employers' H&S duties of care to their employees and persons other than employees. It also presents the influence of prosecution, conviction and further factors and the influence of the CMCHA in the management of H&S in SMEs.

Chapter 7 presents the findings of the inferential statistic tests and show the models of relation between the assessed quantitative variables of the study.

Chapter 8 interrogates the findings of the qualitative inquiry with reference to the quantitative findings.

Chapter 9 presents the steps undertaken to justify validity in respect of this research.

Chapter 10 summarises the research. The final chapter outlines the main findings of the study and the implications for the construction industry. This chapter also presents a reflection which highlights the limitations of the research and aspects where there is potential for improvement.

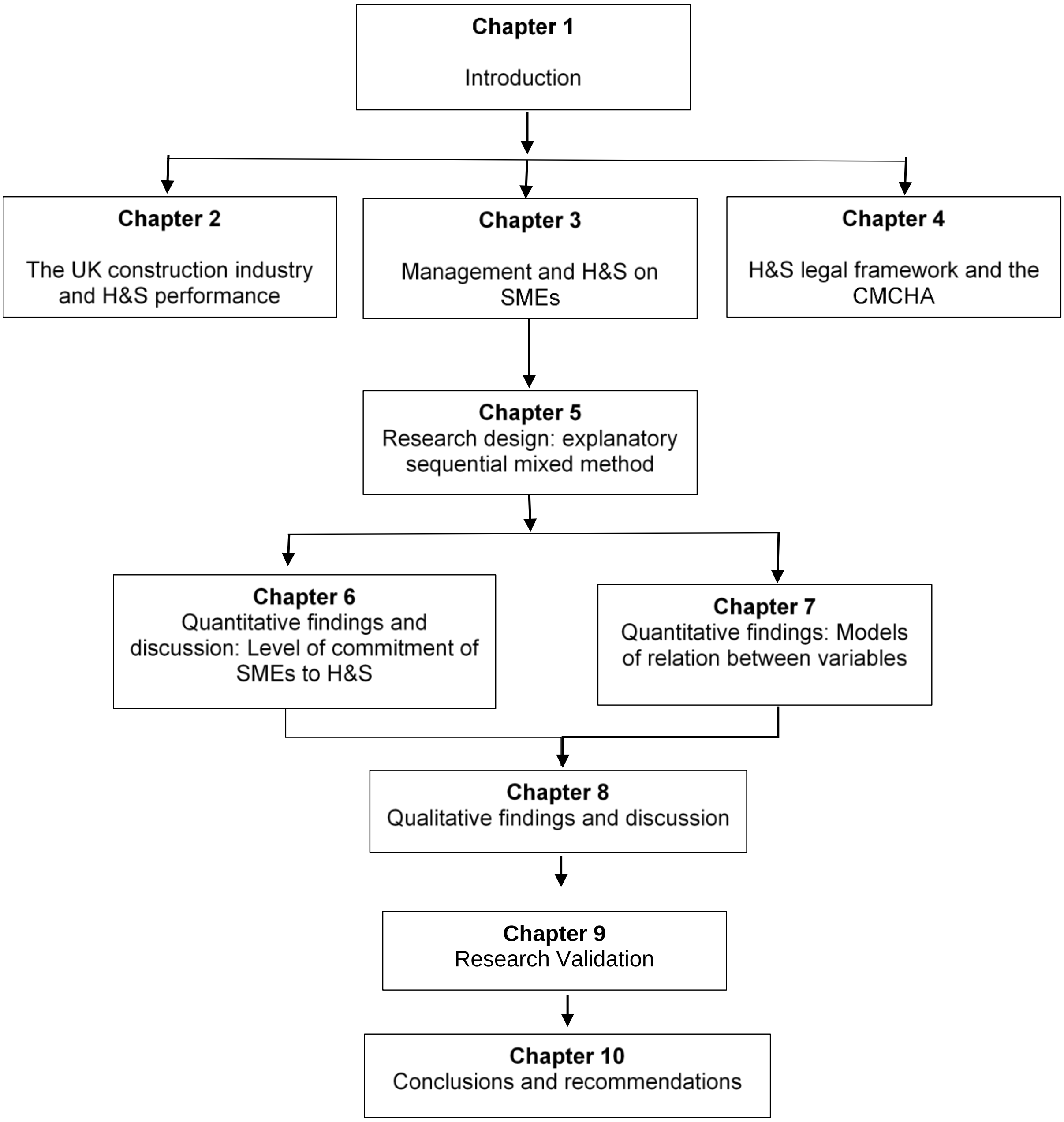

Figure 1-2. Structure of the thesis

Chapter 2: Health and Safety in the UK Construction Industry

2.1 Introduction

It is widely known that people have been dying from injuries and ill-health in the workplace for centuries. The construction environment is considered as one of the most dangerous places to work (Perttula et al., 2003), accounting for a high rate of accidents and fatalities (HSE, 2018). In the UK, the construction industry is constantly facing challenges attempting to improve its health and safety performance (Bust, Gibb and Pink, 2008; Oswald et al, 2018). This chapter aims to fulfil in part the second objective of the research by presenting an overview of the state of health and safety in the UK construction industry. The chapter begins explaining the importance of the construction industry to the UK economy. In addition, the concepts of health, safety and accident are defined as applied in this research. Thereafter, it reviews the health and safety statistics focusing in fatal and non-fatal injuries, illness and the cost of these accidents. Finally, the chapter explains how the construction industry is structured in the UK, highlighting its challenges for health and safety improvement.

2.2 The Role of the Construction Industry in the UK Economy

Before reviewing the health and safety performance of the construction industry, it is important to outline its influence in the UK economy. The Office for National Statistics (ONS) defines the sector as activities related to the 'construction of new buildings and repairs or alterations to existing properties in Great Britain measured by the amount charged for the work, including work by civil engineering companies' (BIS, 2013b). It is generally noted for its provision of housing, educational, industrial, commercial, health and infrastructure facitities. Based on its important role in the society, the construction industry has been one of the main contributors to economic growth across the world for the last two decades (Rhodes, 2018). In the UK, the proportion of total economic output accounted for by the construction sector has increased over the past 20 years from 3.8% to 6.6% from 1997 to 2017. In 2017, the construction sector accounted for 6% (£113 billion) of the Gross Value Added (GVA) for the UK economy (Rhodes, 2018), showing an increase of 14% when compared to the previous year. This has shown a sustained growth since 2013 which is considered an unusual period of growth for the construction industry. This sustained growth, shown in Figure 2-1, places the industry in its highest level since the recession of 2008 (as).

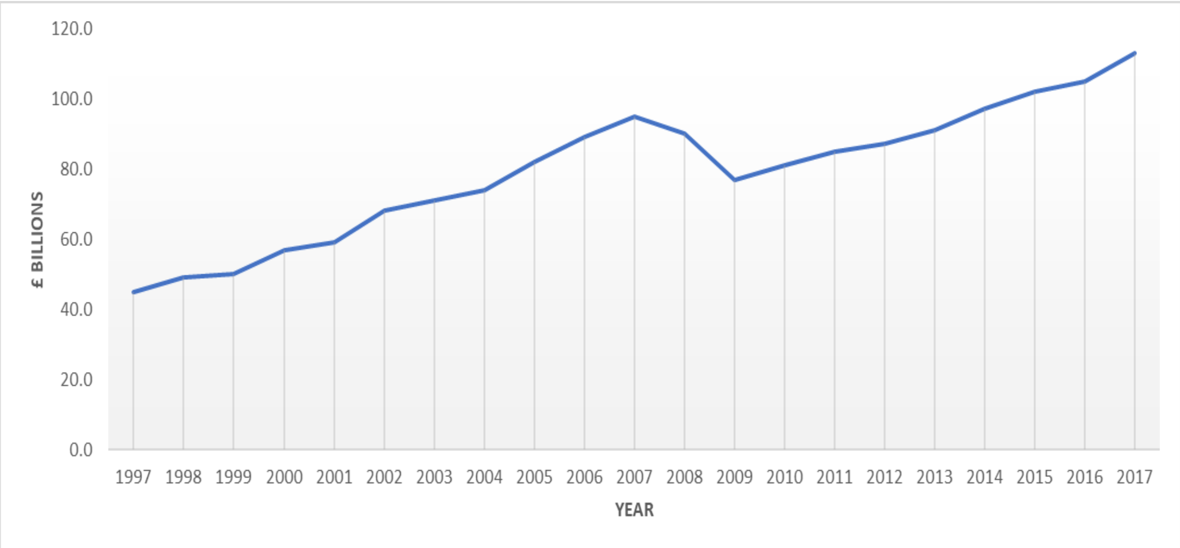

Figure 2-1. Construction sector's contribution to the UK economy (Rhodes, 2018).

The construction sector is also a good source of employment in the UK. According to the national report by Rhodes (2018) based on the statistics provided by the ONS, there were around 2.4 million jobs attributable to the sector by the end of 2018, which represents 6.8% of all jobs in the UK. These numbers have been broadly stable during the last decade, having decreased less than 1% when compared to 2008 (7.3%) (as shown in Table 2-1). The fact that the number of construction jobs has fallen as a proportion of all jobs means that the construction sector has become more productive over the past decade.

Table 2-1. Workforce jobs in the UK construction industry (Rhodes, 2018).

Year	Jobs (Millions)	% of Total Jobs
2008	2.37	7.3%
2009	2.18	6.9%
2010	2.08	6.6%
2011	2.09	6.6%
2012	2.07	6.5%
2013	2.07	6.4%
2014	2.14	6.4%
2015	2.18	6.4%
2016	2.21	6.4%
2017	2.35	6.7%
2018	2.38	6.8%

To preserve these significant numbers, the UK is constantly using research as a tool to identify areas for possible improvement. This is why the construction industry has become the focus of numerous reviews aiming to make it a more efficient and productive sector. For instance, in 2013, the government published the industrial strategy "Construction 2025" as a long-term strategic action plan to promote the success of the sector and enhance growth by over 70% by 2025 (BIS, 2013a). The strategic ambitions are mainly focused on smart technologies, green construction and overseas trade. Similarly, the "Plan for Growth" (BIS, 2011) supported the construction industry by highlighting the role of investment in infrastructure projects and house building. For this purpose, the government has announced economic measures to support house building, which was the sector of the industry most affected by the devastating financial collapse of 2008 (Rhodes, 2015).

However, to achieve a positive performance, the construction industry owns the duty of managing different aspects in the way they carry out their activities. Health and safety (H&S) is one of the main areas of the industry to be constantly addressed therefore, is the main direction of this research.

2.3 Defining Health and Safety

The phrase 'health and safety' is a common term when referring to the construction work environment. It is thus important to understand its definition. On the one hand, '*safety*' is defined by Davies and Tomasin (1996) as freedom from risk of injury from any unplanned event in a working environment. Similarly, Holt (2001) later stated that safety is the absence of danger, a state of protection or refers to any condition which does not involve risk. A simpler definition is given by Hughes and Ferrett (2011), who simply wrote: "Safety is the protection of people from physical injury". On the other hand, '*health*' is defined by Hughes and Ferrett (2011) as "the protection of the bodies and minds of people from illness resulting from the materials, processes or procedures used in the workplace". When used together, the concept of health and safety indicates concern for the physical and mental wellbeing of the individual in the workplace, and this is adopted as the definition of H&S in this research.

Applied to the construction sector, health and safety is associated to all actions and policies designed to preserve the health of those who perform different kinds of engineering works such as building, operating, maintaining and demolishing. It can equally relate to reducing the danger of physical injury and the risk of damage to health over a period of time (Davies and Tomasin, 1996).

2.4 Accidents and Their Causes

The failure of health and safety leads to the occurrence of accidents, which has also been defined in several ways (cf. Arbous and Kerrich, 1951; Baxendale and Jones, 2000; Holt, 2001). For instance, Holt (2001) defined accident as a sequence of events or actions resulting in an undesired consequence (i.e. injury, property damage, interruption, delay). An earlier definition was given by Arbous and Kerrichn (1951) who defined accident as an "unplanned event which, being the result of some non-adjusted act on the part of the individual (variously caused), may or may not result in injury". Applied to health and safety, Baxendale and Jones (2000) adopted a more specific definition for accident. They defined it as "any unplanned event that results in injury or ill health of people, or damage or loss to property, plant, materials or the environment or a loss of a business opportunity". The latter is also the definition given by the HSE (in Hughes and Ferrett (2016)). A common theme amongst all definitions is that accidents are unplanned or expected events. For this research, the HSE definition is adopted as is it the official body for H&S matters in the UK. With an understanding of these definitions, it could be implied that accidents are determinant in the performance of a construction project, as they have a direct effect in the three basic construction elements: plant, materials and workforce.

Although not every accident results in a fatality, it is the frequency of these accidents that has led authors to label the construction industry as one of the most dangerous (Perttula et al., 2003). It has been therefore a long-term goal for the industry to considerably reduce the frequency of accidents. When setting targets, it is however important to understand that the ambition of achieving zero occurrence of accidents is unreachable, due to the infinite possibility of things going wrong (Holt, 2001).

Accidents investigation has been considered an effective strategy to prevent accidents (Laflamme, 1990; Sklet, 2004). Although Abdelhamid and Everett (2000) claim that accidents are superficially investigated, Manu et al. (2012) remark that academics have made significant contributions in accident prevention by trying to find the "how" and "why" of the accident's occurrence. For instance, Holt (2001) made a significant contribution when divided the causes of accidents in primary, to be the immediate causes at the moment of the accident; and secondary, which are the failures of the management system to anticipate the accident. These last are believed to be harder to identify but, are attributable to be the key of accidents prevention. The main causes of accidents in the construction industry have been identified throughout the years and have served to the industry as a starting point when managing health and safety in the workplace (Sawacha, Naoum and Fong, 1999; Holt, 2001; Gibb et al., 2006; Holt and Allen, 2015). A list of these causes is presented in Table 2-2.

Table 2-2. Causes of accidents in the construction industry.

Causes of accidents in the construction industry	
Failure in education	Lack of training
Lack of maintenance	Lack of supervision
Lack of resources	Inadequate job planning and instruction
Error of judgment	Non-existence of a safety system
Carelessness	Apathy
Size of organisation	Unsafe behaviour

Although most of accident causes have been identified, Abdelhamid and Everett (2000) reported that the effectiveness of accident prevention could be improved if efforts are also directed to the roots instead of the symptoms. To this end, causation models focused on the roots of accidents have been developed and disseminated. Amongst these models we can find the Domino Theory (Heinrich, 1941), Swiss Cheese

Accident Causation Model (Reason, 1977), Pathogen Model (Reason, 1990), Accident Root Causes Tracing Model (ARCTM) (Abdelhamid and Everett, 2000); Model of Construction Accident Causation (Suraji, Duff and Peckitt, 2001), and more recently the Modified Loss Causation Model (MLCM) (Chua and Goh, 2004), Systems-Theoretic Accident Model and Process (STAMP) (Leveson, 2004) and the Functional Resonance Accident Model (FRAM) (Hollnagel, 2004).

Despite the evidence that great efforts have been made to prevent accidents in the workplace, an unacceptable number of harmful events are still taking place in the UK construction industry. The statistics of the occurrence of these accidents are discussed in the next section.

2.5 Health and Safety Performance of the UK Construction Industry

2.5.1 Fatal injuries

The UK consistently has one of the lowest rates of fatal injury across the EU. The HSE (HSE, 2016a) reported that in 2013, the UK had a rate of 0.51 fatal injury per 100,000 employees, which is considerably lower than most of the EU member states, including other large economies such as Germany (0.81), France (2.94), Spain (1.55) and Italy (1.24) (see Figure 2-2).

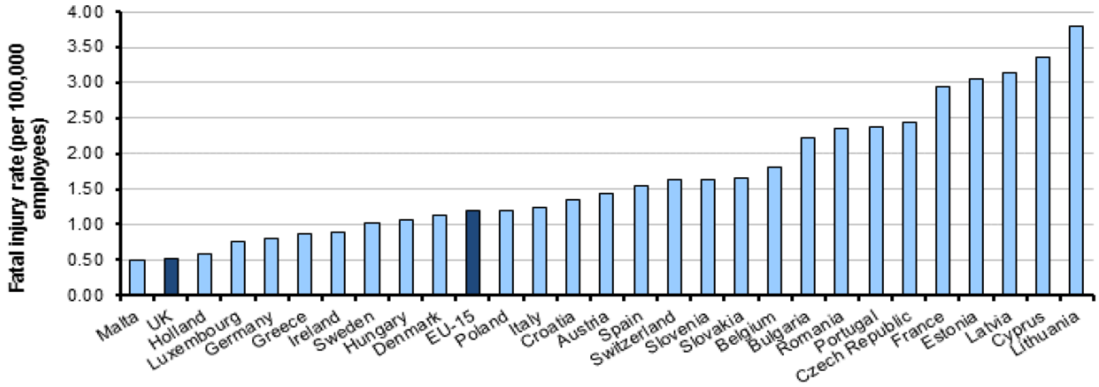

Figure 2-2. Fatal injury rate per 100,000 across the EU. (Extracted from HSE (2016a))

However, a critical look at the UK health and safety statistics raises concern in regard to the performance of the UK construction industry. Although there has been significant reduction in the number of fatalities in the UK over the last 20 years, the construction sector remains a high-risk industry. As shown in Figure 2-3, the construction industry has accounted for a higher number of fatalities throughout the years when compared to other large sectors such as manufacturing and agriculture.

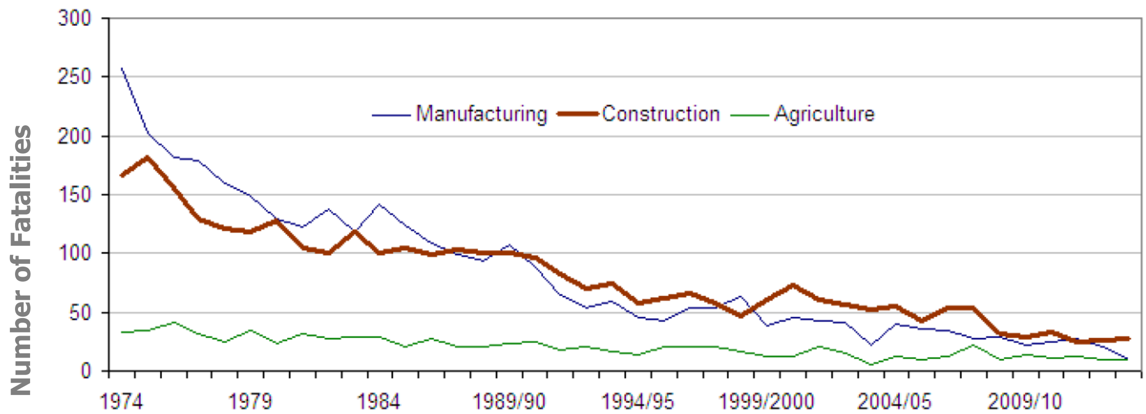

Figure 2-3. Fatalities in the UK industries. (Extracted from HSE (2015))

Following the most recent statistics, the construction industry accounted for 38 fatal injuries to workers in 2017/2018, being the highest figure within the UK economic sectors (as shown in Figure 2-4). This figure is similar to the average the industry has shown during the previous five-year (39) (as shown in Figure 2-5).

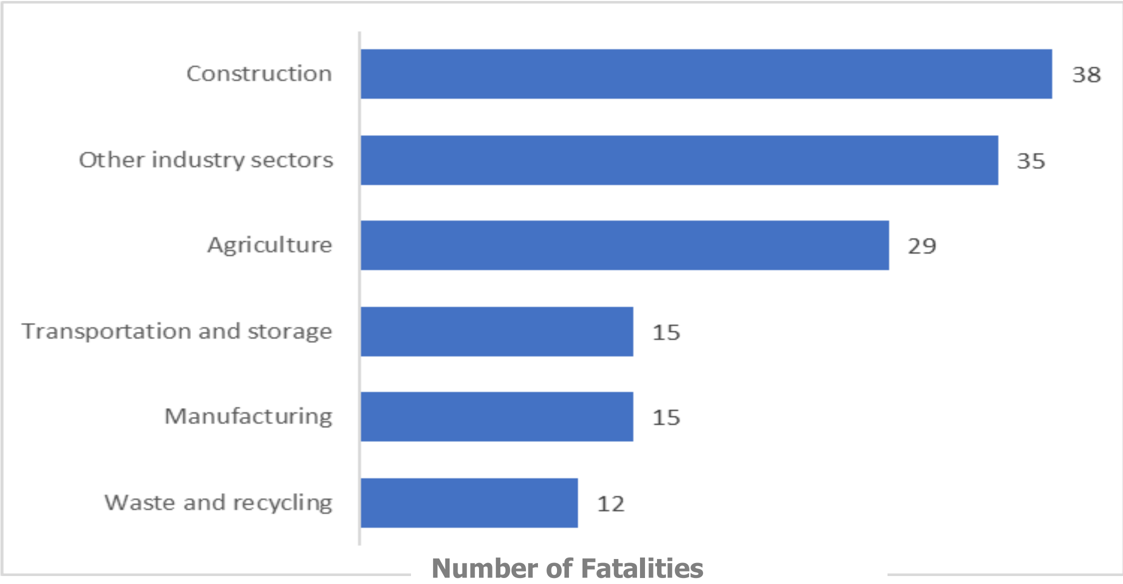

Figure 2-4. Fatal injuries by industry 2017/2018 (HSE Annual Statistics 2018).

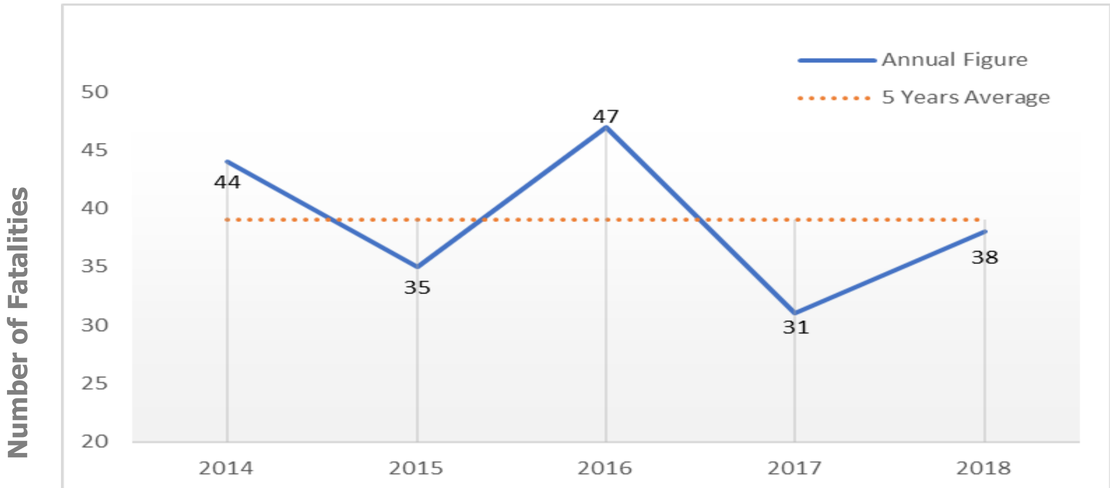

Figure 2-5. Number of fatalities per year in the construction industry 2014-2018 (HSE Database)

The HSE reported that almost half of the fatal injuries to workers in the construction sector were caused by the usual top five causes of fatal injuries in construction sites: fall from heights (48%) along with other causes such as trapped by something collapsing (12%), contact with electricity (6%) and struck by objects (11%) or vehicles (9%) (HSE, 2018).

For further analysis, the health and safety performance can be also measured by the rate of fatal injury per 100,000 employed. In 2017/2018, the construction industry accumulated a rate of 1.64; which is over 4 times the average rate across all sectors during the same year (0.45 fatal injuries per 100,000 employed). Notably, the construction industry does not account for the highest rate when compared to the other economic sectors (see Figure 2-6), it has been the persistence of the rate what has raised an alarm within health and safety stakeholders.

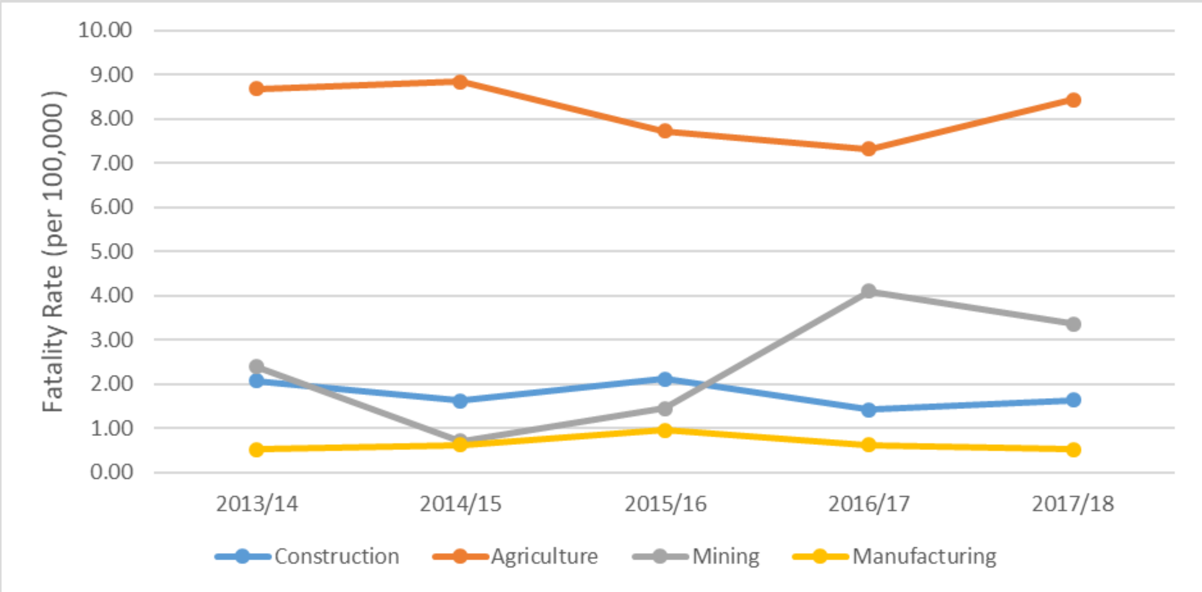

Figure 2-6. Fatality rate per 100,000 workers in the UK industries from 2014-2018 (HSE Database)

2.5.2 Non-fatal injuries

The construction industry also accounts for a high number of non-fatal injuries to workers. The statistics of non-fatal injuries reveals that the construction sector is amongst the top sectors causing harm to its employees. In terms of numbers, the industry has even persistently registered the highest rate making it the worst industry with respect to non-fatal injuries. In 2017/2018, the Labour Force Survey reported that the industry accounted for around 58,000 cases of workplace injury, accounting for over 10% of the non-fatal injuries reported by all the industries in the UK (HSE, 2018). When looking at the causes of these injuries, it was reported to be mainly by fall from height (33%), slip, trip or falls (30%), struck by object (13%), and lifting and handling (7%). Figure 2-7 shows how the numbers of the construction industry compares to other large industries in a three-year average. Even though there has been an overall 40% reduction in the average rate of all workplace since 2001/02 (shown in Figure 2-8), the steadiness of the trend in the past five years evidences a lack of improvement in the way health and safety is currently being managed.

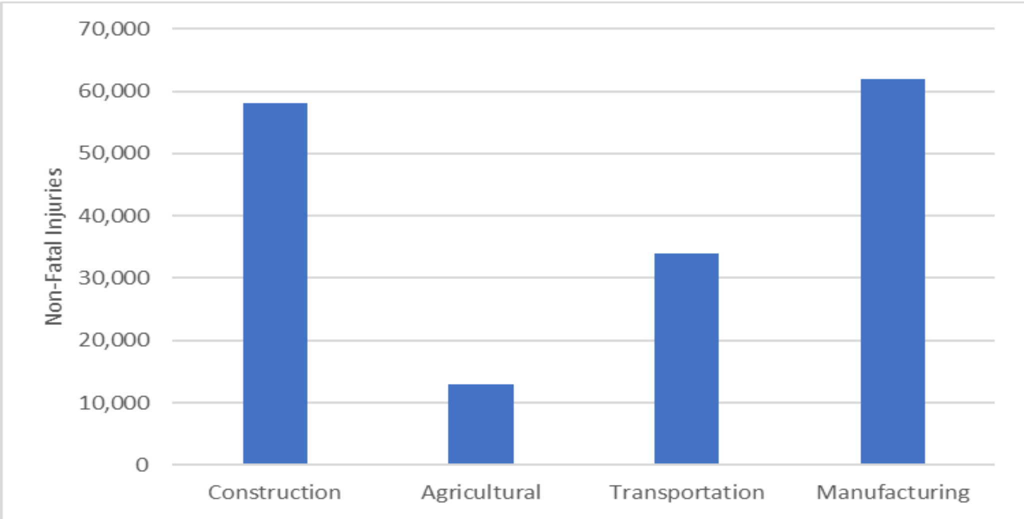

Figure 2-7. Non-Fatal Injuries Average UK Industries 2015/16 to 2017/18 (HSE Database)

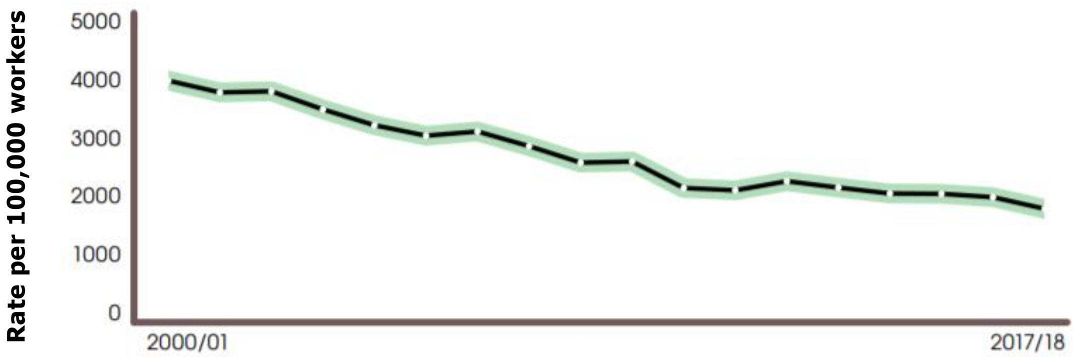

Figure 2-8. Estimated self-reported workplace non-fatal injuries per 100,000 workers in the construction industry (HSE, 2018).

2.5.3 Illness and diseases

Besides the numerous fatality and injury cases occurring in the construction workplace, the industry is also accountable for a considerable amount of occupational diseases. Health problems such as stress, depression, anxiety, lung and hearing problems, skin and infectious diseases and musculoskeletal disorders are commonplace in the industry. The HSE reported (as shown in Figure 2-9) that during 2017/18 there were an estimate of 82,000 new or long-standing construction workers suffering from a health problem caused by their work. The figure shows that the cases of musculoskeletal disorders are doubled when compared to the other illness. Although the numbers are not discussed in this research, the construction industry has the largest burden of occupational cancer deaths among the industrial sectors. Most of these are caused by the exposure to asbestos and silica throughout the years. The occurrence of these fatal and non-fatal accidents and deceases is associated with significant costs to the industry. These are explained in the next section.

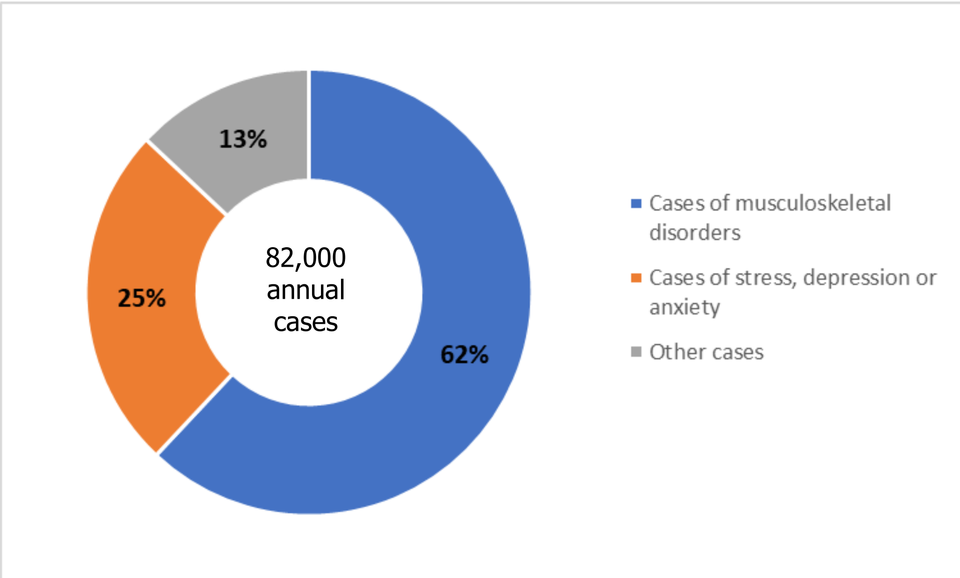

Figure 2-9. Different types of work-related ill health cases in the construction industry 2017/18 (HSE, 2018).

2.6 The Cost of Fatal and Non-Fatal Accidents

The economic cost of the accidents is one of the drivers for promoting good standards of health and safety. In addition to the financial costs (i.e. production and healthcare), accidents incur human costs, which represent a monetary estimate of the loss of quality of life of the workers. Other costs such as pain, suffering and psychological impact caused to victims, their families and friends are difficult to calculate monetarily. In the statistics corresponding to 2016/2017, work-related injuries and illness cost £15 billion to Britain, from which approximately £1 billion is accountable to the construction industry (HSE, 2018). These costs can be considered in terms of direct costs and also indirect costs, which according to Hughes and Ferrett (2016), could be 36 times greater than the direct costs. Some of these costs are not covered by insurers which indicates that organisations tend to suffer the impact of accidents. Among the direct and indirect costs are the items shown in Table 2-3.

Table 2-3. Direct and indirect cost of accidents.

Direct Costs	Indirect Costs
Claims on employers and public liability insurance	Business loss
Damage to buildings or plant	Product liability claims
Absence of employees	Recruitment and training of replacement staff
Fines from prosecutions	Loss of goodwill
Sick pay	Poor corporate image
Insurance cost	Accident investigation time
Compensations	Production delays
Legal representation	Overtime payments

Source: Darshi De Saram and Tang (2005); Hughes and Ferrett (2016)

All these costs and the potential consequences of accidents dent the reputation of the construction industry and are therefore worthy of consideration as they could encourage organisations to pursue a better H&S performance. To provide a better insight of the characteristics of the construction industry and identify areas for improvement, it is necessary to understand its structure and how the industry operates in the UK. This is thus discussed in the following section.

2.7 Overview of the Structure of the UK Construction Industry

The construction industry is a project-based industry that embraces all aspects of residential and non-residential buildings, construction works on civil engineering projects and specialist construction activities (such as plumbing and electrical installation) (Rhodes, 2018). It covers new and existing works such as housing works, hospitals, schools, commercial and industrial buildings, roads, bridges and power plants. Among these, the industry addresses the planning, regulation, design, construction and maintenance of projects. The Department for Business, Innovation and Skills divides the construction industry into three sub-sections: contracting, services and products (BIS, 2013b). These are described below:

a) Contracting

The contracting sub-sector is considered the largest part of the construction industry, accounting in 2011 for approximately 70% of the total added value of the industry and about 70% of the sector's jobs. In the same year, construction contracting contributed £63 billion in GVA to the UK economy with more than 2 million jobs. The contracting sub-sector is sub-divided into construction of buildings, civil engineering and specialised construction activities.

b) Services

Even though the services provided by the industry represent a smaller proportion of its contribution to the economy, they remain key elements in the performance of the construction sector. In 2011, there were 30,000 construction service companies, which accounted for £14 billion of the total GVA and around 600,000 jobs. The main areas of focus of these services are architecture and quantity surveying activities.

c) Products

This subsector consists of the manufacture of construction products and materials. From an economic perspective, 18,000 construction manufacture businesses contributed £13 billion in GVA in 2011. Metal structures businesses accounted for more than 30% of the total contribution.

The construction industry offers its services to public and private entities. As reported by the ONS (in Rhodes (2018)), the private sector accounted overall for three quarters of all construction orders. A detailed report in the different sectors is illustrated in Table 2-4.

Table 2-4. Value of output in the construction industry.

Value of Construction Output (2017)	
Private Sector	**51%**
Housing	21%
Infrastructure	8%
Other	22%
Public Sector	**16%**
Housing	4%
Infrastructure	5%
Other	7%
Repairs and maintenance	**33%**

Source: ONS, Output in the construction industry, Table 2a

The construction industry by its characteristics and different sectors poses challenges to achieving H&S improvements in the workplace. These challenges are also worthy of consideration and are therefore presented in the following section.

2.8 Health and Safety Challenges in the UK Construction Industry

It can be inferred from the statistics that the construction industry currently faces health and safety challenges which have resulted difficult to overcome (Bust, Gibb and Pink, 2008; Oswald et al, 2018). This research is focused on two main issues: lack of integration in the supply chain and role of small and medium enterprises (SMEs). These are discussed in detail in the following sub-sections.

2.8.1 The supply chain and the industry fragmentation

The continuous expansion of the industry and the complexity of the features and requirements of the construction projects have led to a massive fragmentation in the workforce and professional disciplines. The challenge of successfully achieving the project objectives has activated the incorporation of subcontracting and, therefore, the concept of a supply chain. This is evident in the considerable number of bodies for designers, contractors, suppliers and trades unions (Manu, 2012). The fragmented structure presents a multi-party scenario as showed in Figure 2-10.

Egan (1998) reported that even though the existing fragmentation could provide flexibility to deal with an extensive workload, it inhibits performance due to the lack of teamwork caused by the extensive subcontracting. This issue is being considered the root cause of the construction industry issues (Latham, 1994; Egan, 1998; Oyegoke, McDermott and Dickinson, 2010).

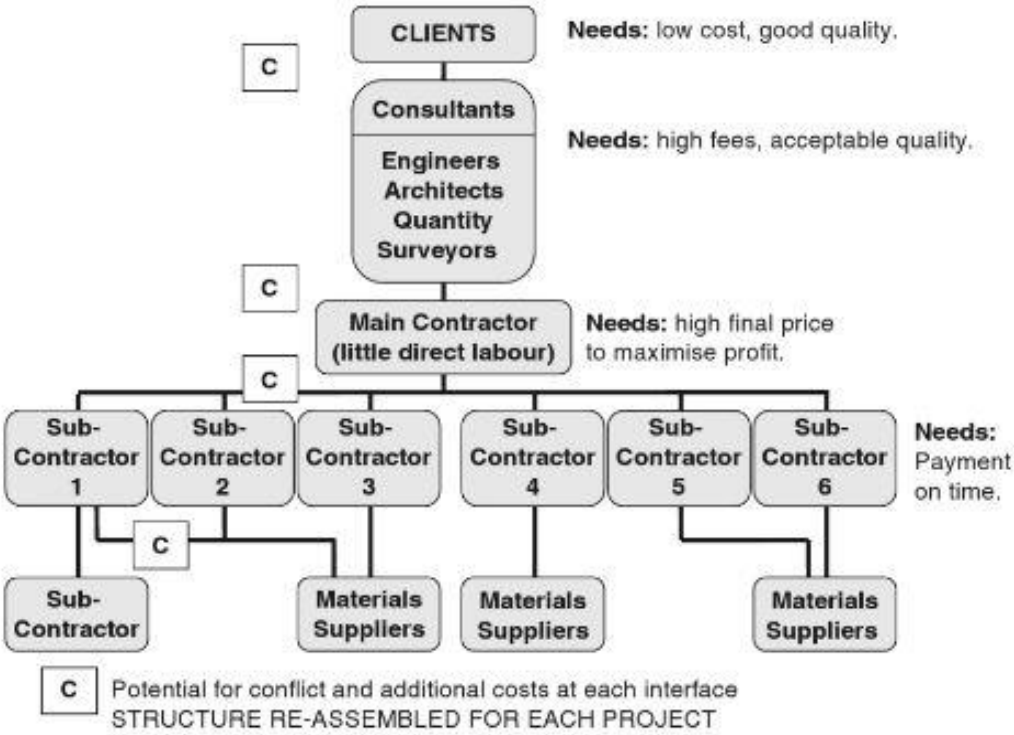

Figure 2-10. The construction supply chain. Source: Cox and Townsend (1998); Pryke (2009)

The highly fragmented nature of the industry along with the considerable variation and size of project-based work impacts the performance of health and safety management (Brabazon, Tipping and Jones, 2000; Haslam et al., 2005; Behm, 2005). This is related to the fact that parties tend to minimise their exposure by transferring the risk to the different levels of the chain. The dominant culture of risk transfer in the construction industry ensures that the H&S responsibilities of the principal contractor are transferred to sub-contractors which often lack the expertise and legal resources to interpret and implement them effectively (Loosemore and Andonakis, 2007). Effective health and safety management is only possible when the safety management systems of principal contractors and subcontractors complement one another (Kheni, Dainty and Gibb, 2005). As the interests from these participants may differ from the others, risk transfers cause tension and conflicts. This adversarial relationship between stakeholders has been recognised as a problem for years (Cox and Townsend, 1998) and is one the reason why the UK construction industry has been catalogued of being wasteful, inefficient and ineffective (Pryke, 2009).

This reliance on subcontracting in the construction industry leads to a number of issues for health and safety, in terms of clarity of duties and working relationships, consistency of H&S practices, competence, communication and cooperation among the workforce (Mayhew and Quinlan, 1997; Arditi and Chotibhongs, 2005; Manu et al., 2013). Loosemore and Andonakis (2007) highlighted that subcontracting has created many H&S management problems for principal contractors because of the constant changing in contractual relationships, which can confuse responsibilities for H&S management and reporting. This suggests that many subcontractors are not aware of their H&S obligations.

The UK government has made significant effort attempting to overcome the barriers imposed by the organisational fragmentation in the construction industry. It has supported multiple studies across the years such as The Latham Report "Constructing the Team" (1994), The Egan Report "Rethinking Construction" (1998) and The Wolstenholme Review "Never Waste a Good Crisis" (2009). After all, all these studies agree on suggesting the enhancement of a more collaborative and integrated approach or partnering within the industry (Latham, 1994; Egan, 1998; Oyegoke, McDermott and Dickinson, 2010; Mohd Nawi, Baluch and Bahauddin, 2014).

2.8.2 Definition and role of the small and medium enterprises (SMEs) in the construction industry

In most countries, it is common to find that SMEs constitute a large majority of all businesses and account for a considerable amount of jobs (Hasle, Kines and Andersen, 2009). In terms of definition, SMEs are classified considering the number of full-time employees and, as suggested by Bolton (1971), by the turnover. The European Commission (EC) has established a classification for SMEs as shown in Table 2-5.

Table 2-5. EU classification and definition of SMEs.

Company category	Staff headcount	Turnover	or	Balance sheet total
Medium-sized	< 250	≤ € 50 m		≤ € 43 m
Small	< 50	≤ € 10 m		≤ € 10 m
Micro	< 10	≤ € 2 m		≤ € 2 m

Source: European Commission (2016)

However, definitions may vary across different countries. According to the report by Rhodes and Ward (2014), the UK adopted the concept of the EC in regard to the staff headcount but, have a different consideration when looking at the turnover and balance sheet of the organisations. The UK classifies SMEs according to the Companies Act 2006 (as shown in Table 2-6). Considering that this study is focused on the UK, the latter is the classification adopted throughout the research.

Table 2-6. Classification and definition of SMEs in the UK

Company category	Staff headcount	Turnover	or	Balance sheet total
Medium-sized	< 250	≤ £ 36 m		≤ £ 18 m
Small	< 50	≤ £ 10.2 m		≤ £ 5.1 m
Micro	< 10	≤ £ 632 k		≤ £ 316 k

Source: Companies Act 2006

In the UK construction industry, SMEs constitute around 90% of the construction supply chain (BIS, 2013b). They therefore play an important role in the construction industry's operation scheme, with over 80% of employment and 67% of the turnover generation (Arewa and Farrell, 2012). However, SMEs have accounted for nearly 80% of non-fatal injuries in the workplace for the last ten years (LFS, 2016) and in some cases 90% of fatal accidents (Phillips, 2011). They therefore account for a large number of fatal injuries. It is the reason why being involved in an SME environment has been labelled as risky in terms of exposure to hazards and death (Arocena and Nunez, 2010).

Although the HSE does not collect data on major injuries according to the size of organisations, Kheni, Dainty and Gibb (2005) reported that there is an inverse relationship between business size and occupational accidents. The study suggested that small workplaces are more likely to have accidents than larger ones. Bomel Limited (2007) also reported that the size of an organisation is considered to be a key factor with large organisations showing higher levels of competence on average than SMEs. Similar findings have been also reported in the construction industry of other countries such as Spain, Italy and Taiwan (Fabiano, Currò and Pastorino, 2004; Chi, Chang and Hung, 2004; Camino López et al., 2008).

It is believed that this situation can be attributable to the limited resources of small organisations compared to larger organisations which increases the difficulties is SMEs to comply with health and safety regulations and apply more systematic approaches to H&S management (Hasle, Kines and Andersen, 2009). Similarly, Kheni (2008) argued that the growth performance and the management experience also correlate with the propensity to adopt health and safety improvement measures. Amongst other reasons, it has been evidenced that the lack of an acceptable performance of SMEs is also linked to lack of adequate resources and to the lack knowledge regarding the health and safety risks (Champoux and Brun, 2003). Based on the statistical numbers and extant literature, the huge involvement of SMEs in construction thus condemns health and safety to be one of the main issues currently faced by the UK construction industry. Among the improvement efforts, management has been highlighted as prominent and is therefore addressed in the next section.

2.9 The Management Solution to H&S Accidents

Accidents, ill health and incidents are indeed random events and they generally arise from failures of hazard controls in all kind of organisations and industries (HSE, 2013d). But, it is important to highlight that accident prevention in the construction industry does not rest entirely in the construction phase of a project as it is commonly believed (Manu, 2012). In line with this argument, research studies by Hecker, Gambatese and Weinstein (2005); Weinstein, Gambatese and Hecker (2005); Gambatese, Behm and Rajendran (2008) confirmed the existence of a link between the design and construction phase for the prevention of accidents.

When analysing the causes of these accidents, the International Labour Organisation agrees that up to 90 percent of all workplace accidents are caused by human failure (Feyer and Williamson, 2012). It is easy to be misled and believe that these human errors arise because of carelessness, inattention and incompetence by the workforce. However, they also suggested that human error in the workplace is attributed to organisational failings. In the construction sector, Sawacha, Naoum and Fong (1999) and Rundmo and Hale (2003) concluded that safety performance in construction organisations is strongly linked to the effectiveness of the implementation of a safety management system. Similarly, Hughes and Ferrett (2011) estimated that 70% of construction accidents could be prevented by good management performance. More recently, Gopang et al. (2017) argued that an effective implementation of a safety system is likely to reduce the rate of accidents, material damage, personal injuries and absenteeism of employees, and improve the working conditions, productivity, sales and profit. Assessing and detecting failures in the management of H&S is therefore a common approach in the attempt to prevent accidents in the workplace. To understand how health and safety systems work, it is important to explore the concept of management and how it can be applied to H&S. The concept of management in H&S is thus addressed in the next chapter of this research.

2.10 Summary

The UK construction industry is responsible for the provision of living and service infrastructures to the nation. It also plays an important role in the UK economy, contributing around £100 billion per year and offering over 2 million jobs. However, despite its socio-economic benefits, it is considered one of the most dangerous industries, as it accounts for a significant number of occupational fatalities, injuries and ill-health. It has been researched that the fragmentation of the construction industry and the consistent role of SMEs are challenges that hinder the efforts towards improving these health and safety numbers. Hereafter, different authors have linked this failure to the efficiency of management within the sector. Thus, the next chapter is focused on the role of management in accident prevention in the construction industry.

Chapter 3: Health and Safety from a Management Perspective

3.1 Introduction

Management is a common approach to prevent the occurrence of accidents in the work environment. The safety performance of the construction industry is reportedly linked to the efficiency of the management strategies implemented in organisations regardless the size. This chapter reviews the literature pertaining to health and safety management and how it can be applied to the construction industry. The first section provides an understanding of the definition of management as a process. This is followed by an overview of the two main modern management theories, scientific management and behavioural management, emphasising on the link to accident causation. It then discusses the concept of the management cycle, the different aspects and variations, and how it can be applied within organisations. Afterwards, the next section discusses the application of the management cycle to health and safety, highlighting how it relates to the management of construction SMEs. This section also reviews existing barriers for implementing health and safety management systems in small and large organisations. The chapter concludes with a summary of the key findings of the literature which the study seeks to address.

3.2 What is Management?

The concept of management and the process of decision making, supervision and control have existed since the development of ancient civilisations, empires, and construction of ancient buildings (Pindur, Rogers and Suk Kim, 1995). It was however in the nineteenth century when it first became an object of study. Nowadays, the term management entails an extensive and complex definition which have led authors to adopt different views and develop different principles on the field. Attempting to understand management from a simple perspective, Boddy (2016) researched that the term is generally associated to a general human activity or to as a distinct occupation. Both of these perspectives are addressed below.

As a human activity, Hales (2001) explains that management takes action when human beings plan and manage their lives. Boddy (2016) added that management can be also perceived as the use of past human experiences to analyse what has happened, what is happening and what will happen in particular situations. As a distinct occupation, management has been conceptualized as: "getting things done with the aid of other people" (Stewart, 1991; Hannagan and Bennett, 2008; Certo, Certo and Barman, 2012). Other authors provide more descriptive definitions when referring to management from an organisational perspective. Some of them define it as "the process of achieving organisational goals and objectives effectively and efficiently through planning, organizing, leading and optimizing the human, material and financial resources available to it" (Pearce and Robinson, 1989; Black and Porter, 2008; Hannagan and Bennett, 2008). Considering construction projects are delivered as a sequence of processes, management is addressed as a distinct occupation throughout this research.

Over the years, scientists and practitioners have developed theories which guide to understand the different scenarios in which management can be applied within society. Nowadays, management is widely implemented in routine activities and has become the basis for the improvement of the performance of operational activities. The main management theories developed throughout the years which form the basis of any management activity are discussed in the next section.

3.3 The Modern Management Theories

It can be argued that the contributors to the theory of management have different approaches when experimenting with management. Although many theories have been developed across the years, the initiators were focused on two main features: the work practice and the human factor. These two features led to the development of two main approaches in modern management: scientific and behavioural. These are addressed below.

3.3.1 Scientific management approach

Scientific management can be defined as the concept of a group of practicing managers who tended to reflect and theorise about their personal experience of management and, as explained by Cole and Kelly (2015), developed prescriptive theories mainly focused on the structure of the practical work within organisations. The widely known "Taylorism" is a key example of this approach in which a complex task is broken into a sequence of simple subtasks. This would allow scientific managers to conduct experiments to find the best way of working. This technique intends to increase the productivity by reducing the skill requirements and task training time (Black and Porter, 2008). As illustrated in Figure 3-1, the theory ignores the satisfaction and working conditions at the workplace.

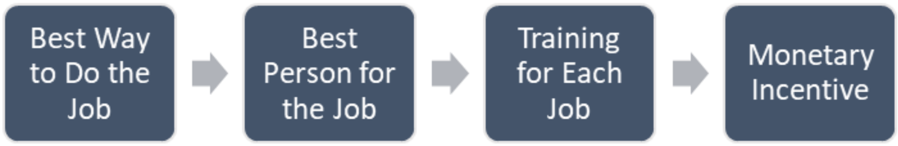

Figure 3-1. Process of Taylorism. Source: Black and Porter (2008)

It is believed that the intense focus on strategic planning in industry today is a result of scientific management (Kiechel, 2010). With the emphasis on research, planning, communications, incentives and feedback, it is possible to track the influence of Taylorism to every sector (Blake and Moseley, 2010).

3.3.2 Behavioural management approach

Adopting a different approach, a group of social scientists were not keen to admit the effect of financial incentives in productivity improvements. Elton Mayo challenged Taylor's belief when he found that employees work harder when they believe that management pays special attention to them and is concerned about their welfare (Black and Porter, 2008). Academics supporting this point of view ground their research on the influence of the human behaviour in the workplace. Cole and Kelly (2015) point out that these studies aim to boost efficiency and productivity by evaluating the individual satisfaction of the employees, concentrating on issues such as leadership, communication and motivation. Figure 3-2 shows a conceptual illustration of behavioural management.

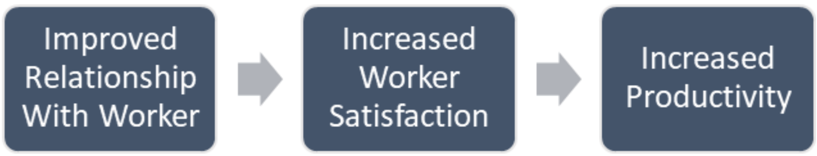

Figure 3-2. Process of Behavioural Management. Source: Black and Porter (2008)

Over time, the development and implementation of a human relation-based strategy have led to the creation of different concepts within behavioural management, such as teamwork, group dynamics and social systems. It has been observed that these elements are essential for the management of health and safety within organisations (Wu, Chen and Li, 2008; Kines et al., 2010; Bratton and Gold, 2012).

It has been reported that accidents are strongly linked to human intervention in the accident causation chain (Heinrich et al., 1980; Duff et al., 1994; Abdelhamid and Everett, 2000; Suraji, Duff and Peckitt, 2001). Indeed, Kheni (2008) highlights that seventy to ninety per cent of accidents are caused by unsafe behaviour. These conclusions have therefore encouraged to implement psychological approaches in health and safety management and the study of accident causation. Accident causation has been previously discussed in section 2.3.

3.4 The Management Cycle

In addition to the two main management principles, the literature of modern management highlights the establishment of Fayol's primary functions of management within organisations. According to Fayol, planning, organising, commanding, coordinating and controlling are the main ingredients to constitute a cycle to effectively meet the organisational goals (Rausch, 2005). These five functions (shown in Figure 3-3) focus on the relationship between personnel and its management and they provide points of reference to address problems in a creative manner. They take account of drawing up a broad plan of where a business is going and how it will operate, organising people, coordinating all the organisations' efforts and activities, and monitoring to check that what is planned is actually carried out. In terms of application, Fayol considered his functions to be flexible and adaptable to every change and need (Wook Yoo, Lemak and Choi, 2006).

Figure 3-3. Fayol's Management Functions. Source: Fayol (1918)

An additional aspect that differenced Fayol's principles from other management authors was the emphasis in the working of the top level of management. For a better understanding, levels of management refer to a line of demarcation between various managerial positions in an organisation. They determine a chain of command, the amount of authority and status of the managerial positions. There are three broad levels in management as presented in Figure 3-4, however, the number of levels is tied to the size of an organisation and the number of employees (DuBrin, 2003).

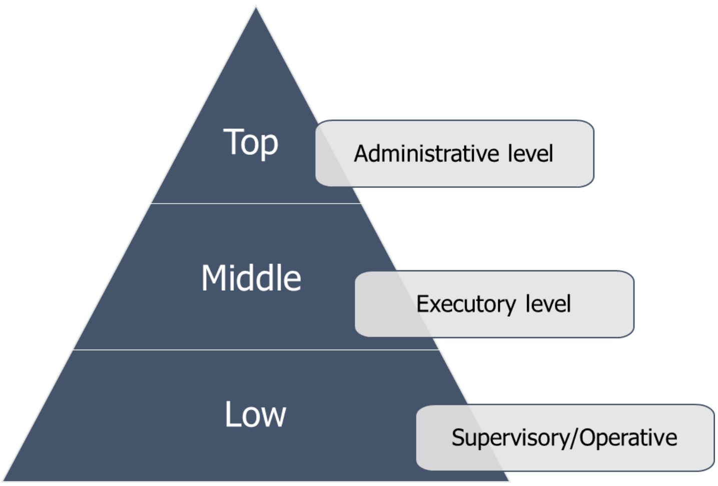

Figure 3-4. Levels of management in organisations (DuBrin, 2003)

- Top level

The top management level is the ultimate source of authority within an organisation and it manages the goals and policies for the business. They apply control and coordination of all the activities of an organisation by taking action on the budget, techniques and agendas. It usually consists of board of directors, chief executive and/or managing directors.

- Middle level

The middle level is comprised by branch managers and departmental managers. They are responsible to the top management for the functioning of their department and for the organisation and direction of the lower level of management. This implies they serve as a communication channel between the top and lower level within an organisation. Amongst the functions of this level of management, it can be highlighted they are responsible for: (i) carrying out the organisations' plan; (ii) administrating the distributing of the tasks and organising the workers; and (iii) motivating the lower level of management.

- Low level

The lower level of the hierarchy is the supervisory and operational level of an organisation. According to management literature, it usually consists of supervisors, foreman, officers, etc. These are more concerned with direction and control function of management. Most decisions in this level require information within the basic business functions in the organisation. Amongst the main functions of managers at the lower level, we can mention: (i) distribute responsibility among the employees; (ii) check the quality of the work; (iii) establish a good communication with the employees; and (iv) produce reports for higher levels of management.

Although the usefulness of Fayol's cycle has been questioned (Carroll and Gillen, 1987; Mintzberg, 1975, 1971), these elements remain to be relevant in current discussions about management roles, actions and models (McNamara, 2009). For instance, the functions of Deming's Plan-Do-Check-Act (PDCA) model of continuous quality improvement, introduced in 1950's (Deming, 1986), present similarities when compared to Fayol's ideas. Attempting to describe the PDCA cycle, Imai (1986) explains that it begins with a study of the current situation, during which data are gathered to be used in formulating a plan for improvement. Once this plan has been finalized, it is implemented. After that, the implementation is checked to see whether it has brought about the anticipated improvement. When the experiment has been successful, a final action such as methodological standardization is taken to ensure that the new methods introduced will be practiced continuously for sustained improvement. Figure 3-5 shows the sequence of the PDCA cycle and the model for improvement.

Similar to Fayol's idea, the sequence of Deming's PDCA cycle was designed for the improvement of any stage of a production stage and as a procedure for finding a special cause of variation indicated statistical signals (Swamidass, 2000). In fact, it can be concluded from the analysis of Fayol's and Deming's conceptual models that both seem to be equivalent when compared to each other. Table 3-1 shows the convergence between the different concepts of the two models. (Moen and Norman, 2011).

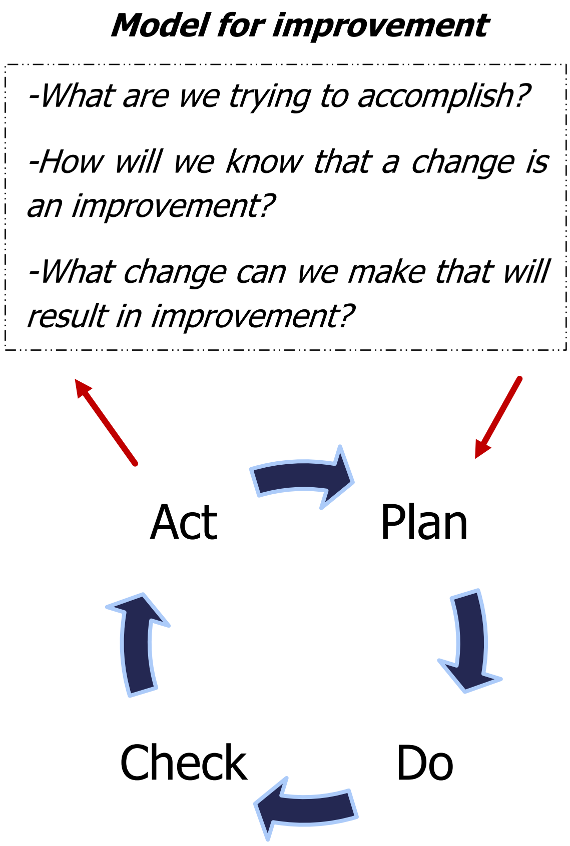

Figure 3-5. Deming's PDCA Cycle. Source: Deming (1986); Moen and Norman (2011).

Table 3-1. Similarities between Fayol's management functions and Deming's PDCA cycle

<table>
<tr><th>FAYOL'S MANAGEMENT FUNCTIONS</th><th>DEMING'S CYCLE</th></tr>
<tr><td>Plan</td><td>Plan</td></tr>
<tr><td>Organise</td><td rowspan="3">Do</td></tr>
<tr><td>Command</td></tr>
<tr><td>Coordinate</td></tr>
<tr><td rowspan="2">Control</td><td>Check</td></tr>
<tr><td>Act</td></tr>
</table>

Some authors consider the PDCA cycle can be used as a framework of any management process as it captures the roles of management defined by the modern management academics (Hannagan and Bennett, 2008; Certo, Certo and Barman, 2012; Boddy, 2016). For example, Hoshin Kanri is a strategic planning system based on Deming's PDCA cycle (Akao, 2004; Cowley and Domb, 2012) developed in Japan. This cycle is also referred in the strategic management concept based on Balanced Scorecard (Kaplan and Norton, 2008). According to Pietrzak and Paliszkiewicz (2015), the iteration of the cycle is the fundamental principle of the PDCA circle as it allows the process to be continuously improved. The stages of the PDCA entail the implementation of a sequence of tasks, which are briefly described as follow (Moen and Norman, 2011; Maruta, 2012; Pietrzak and Paliszkiewicz, 2015):

- Plan

  Based on Deming's concept, the planning as the stage where a strategy is developed and expressed in operational terms by defining objectives and measurable targets. A methodology is also expected to be developed at this stage to be later implemented in the next element of the cycle.

- Do

  During this stage, the planning is put into day-by-day practice. (Kaplan and Norton, 1996) comment that this stage is mainly based on the engagement of employees and therefore appoints communication as the key element for an effective implementation of the strategy.

- Check

  The check stage aims to detect any deviation from course of action and established targets. The plan is reviewed to observe and examine the results achieved aiming to evaluate the effectiveness of the strategy.

- Act

  The last stage of the cycle is entitled to analyse and adjust what was perceived in the checking stage. During this stage, lessons are learned, and the effectiveness of the plan is analysed against the planned objectives. If required, changes are made, and a new iteration of the cycle is established.

Although Deming's circle was developed for manufacturing, Pietrzak and Paliszkiewicz (2015) argues that the cycle is in fact a learning method and its application should not be limited to a particular area. The model has been widely implemented as a problem-solving approach in health care (Beaudin and Beaty, 2004; Saxena, Ramer and Shulman, 2004; Vogel et al., 2011), software management (JingFeng Ning, Zhiyu Chen and Gang Liu, 2010),water treatment (Castro, Pinheiro and Ginoris, 2011) and has been recently tested in energy management (Prashar, 2017).

Research studies assessing the effectiveness of the implementation of the PDCA cycle to the construction sector are not common. However, there are some cases in which the model has been successfully implemented within construction activities (Meiling, Sandberg and Johnsson, 2014). In fact, the PDCA cycle has been recommended as an effective tool for the improvement of the construction process of house buildings, renovations and maintenance (Wideman, 1999; Roy, Low and Waller, 2005). More recently, a study conducted by Ren et al. (2015) analysed the suitability of the model in the management of projects schedule and costs.

The dissemination of the Deming's cycle has also led to the identification of barriers and challenges that could limit its adoption. Some of these are lack of leadership, expertise and the excessive demand of human and economic resources (Meiling, Sandberg and Johnsson, 2014; Reed and Card, 2016). Nowadays, the PDCA iteration is the base of the operation of management systems specifically focused on occupational health and safety. The next section provides an in-depth assessment on how occupational health and safety management systems are structured and how they are applied to the construction industry.

3.5 Occupational Health and Safety Management Systems (OHSMS) in Construction

3.5.1 Definition and implementation of OHSMS

Regardless the industry, nature or size of an organisation, management has been discussed as one of the approaches to mitigate the constant health and safety difficulties (see Section 2.8). A report by Kheni, Dainty and Gibb (2008) remarks that health and safety management in construction has evolved from measures adopted in accident prevention to more systematic and proactive approaches to minimise the risk of hazards in the industry. In effect, a growing number of businesses in the construction sector have tended to focus on the management cycle by developing and implementing health and safety management systems.

Despite the diverse approaches among experts to define occupational health and safety management systems (OHSMS), Gallagher (2000) suggests a simple and accurate definition: "a planned, documented and verifiable method of managing hazards and associated risks". The International Labour Organisation added that it is a logical, stepwise method to decide what needs to be done, how best to do it, monitor progress toward the established goals, evaluate how well it is done and identify areas for improvement (ILO, 2011). Adopting these systems, organisations aim to allocate accountabilities, responsibilities and resources within its organisational structure. The health and safety practices incorporated in OHSMS are mainly voluntary but, in some countries, some practices are required by health and safety regulations. Considering regulations are under continuous improvement, OHSMS must be capable of being adapted to changes.

It has also been argued that any OHSMS should be tailored to the size and activity of the organisation and be focused on general or specific hazards and risks associated with such activity (ILO, 2011). Its complexity can range from the simple needs to multiple hazards industries such as mining, nuclear power, chemical manufacturing, or construction. In recent years, the implementation of OHSMS has retained the attention of organisations, governments and international organisations as a promising strategy to harmonise the requirements of an organisation with occupational health and safety and ensure more effective participation of workers in implementing the preventive measures. So far, a significant number of OHSMS standards and guidelines have been developed by professionals, government and international bodies. Some of these are addressed below.

3.5.2 The Plan-Do-Check-Act (PDCA) as an OHSMS

The UK started a new era in health and safety when the HSE published "*Successful health and safety management*" (HSG65) as a voluntary management system (Yoon et al., 2013). Eventually, the implementation of OHSMS has also caught the attention of other developed countries such as USA, Canada and Australia. The HSG65 covers a guidance for directors, managers and health and safety professionals based on risk management principles outlined by developing policy, identifying responsibilities, establishing procedures, monitoring the performance of the plan and reviewing the effectiveness of the actions. Originally, this management system presented the elements Policy-Organise-Plan-Monitor-Audit-Review (POPMAR) as a cycle. It was later simplified to the Plan-Do-Check-Act (PDCA) approach merging the elements to a simpler structure.

The continuous development of the HSG65 has been one of the multiple approaches of the UK government to publicly support the parts who intend to improve the health and safety performance in organisations. Based on this document, the HSE has also published alternative summary documents, such as the INDG 417, INDG 275 and the INDG 449. The main objective of these additional publications is to offer simple definitions and instructions on how to adopt a health and safety management system in organisations of all sizes and activities (HSE, 2013b, 2013c, 2014b). Following the instructions of the PDCA system addressed in the HSG65, health and safety in organisations can be improved following the tasks allocated to the four elements of the cycle. A brief review of the elements is discussed below.

3.5.2.1 Plan

The first element of the PDCA cycle aims to determine a clear direction of the purpose of the management system. The '*Plan*' stage is comprised by two main tasks: policy and planning (see Figure 3-6). It has been agreed that the creation of a policy sets the direction and becomes the first step in developing a safety program (Martin and Walters, 2001). According to the HSE (2013d), policies should be designed to meet legal requirements, prevent health and safety problems and be capable of responding quickly to new issues. This policy is later incorporated in the implementation plan. The planning of an OHS management system also involves the designing and developing of suitable and proportionate management arrangements to achieve the aim of the policy. Ligade (2013) remarks that the allocation of resources and the identification of the main organisational risks are main tasks to be achieved during this phase. Additionally, the HSE appoints organisations to decide how health and safety will be communicated and promoted within the workers and contractors.

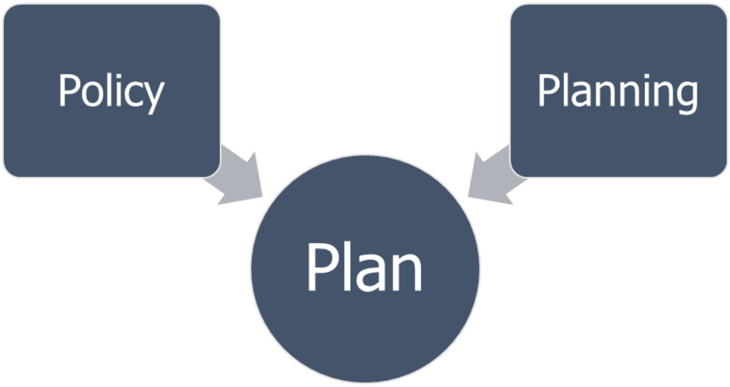

Figure 3-6. The 'Plan' stage. Source: HSG65

3.5.2.2 Do

The second element of the cycle refers to the implementation and delivery of the plan (Ligade, 2013). The main aspects to cover in this stage are: risk profiling, organising and implementing the plan (Figure 3-7). The HSG65 suggests that during this phase, the planned tasks are taken into action and their effectiveness is tested. The HSE agrees that the complexity of the action tasks proposed depends on the size of the organisation. Among these, the document points out the importance of carrying out risk assessments. Additionally, surveillance is also recommended to take place as a tool to evaluate the effectiveness of the safety system and at the same time, protect the health and safety of the employees. Referring to human behaviour, the HSG65 system demands the existence of competence of individuals, which is reported to be achieved through recruitment and training. The system also demands a high level of communication and cooperation between employees, contractors and the board of directors.

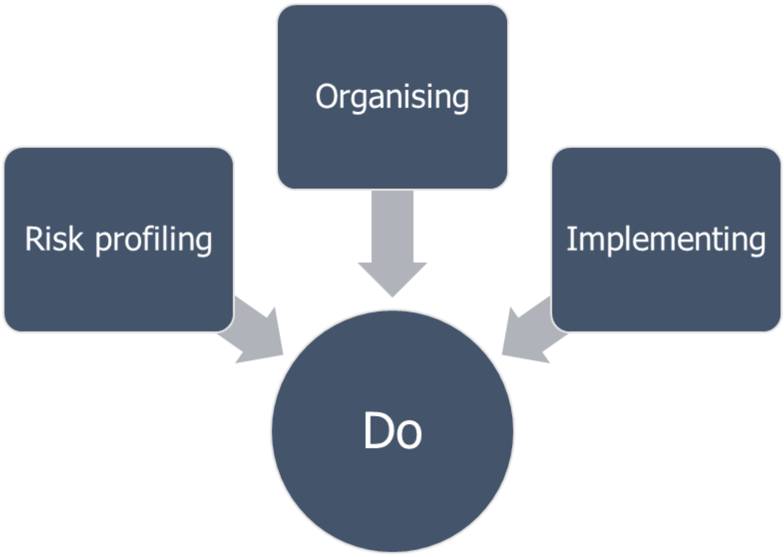

Figure 3-7. The 'Do' stage. Source: HSG65

3.5.2.3 Check

Anything is much easier to control if it is reduced to quantifiable measures (White, 2004). The performance of the plan can be only analysed after it has been monitored and measured. The third element instructs to monitor and measure the performance by assessing how well the risks are being controlled and determining whether the aims are being achieved. Reports showing the progress of the ongoing tasks, such as training and maintenance programmes, are advised to be documented and audited. Apart from assessing the performance of risk control, organisations following the cycle are appointed to investigate the causes of accidents, incidents and near misses as part of the monitoring tasks. Findings from the investigations can detect possible vulnerable areas of a safety system and lead to innovative approaches or modifications within the system. Figure 3-8 illustrates these tasks as given by the HGS65.

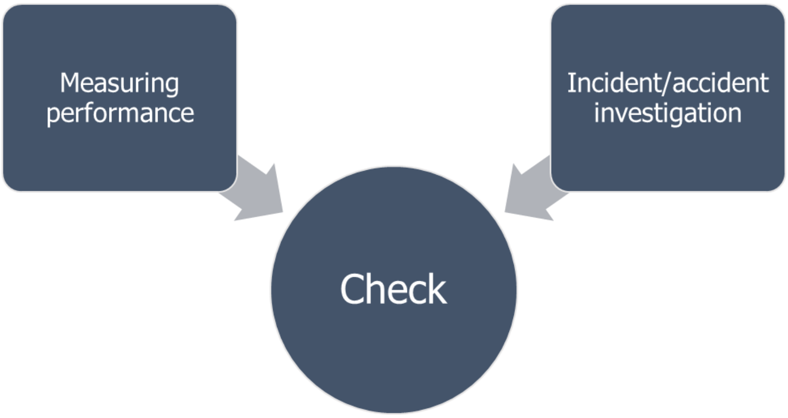

Figure 3-8. The 'Check' stage. Source: HSG65

3.5.2.4 Act

The last element of the cycle is also a two-task stage which encourages to draw lessons and take action from the accidents, incidents and errors reported during monitoring and auditing (as shown in Figure 3-9). The HSE assures that reviewing the results enables the opportunity to check the validity of the health and safety policy and to draw conclusions on the effectiveness of the system. The outcomes of these evaluation later become the start the new iteration of the cycle.

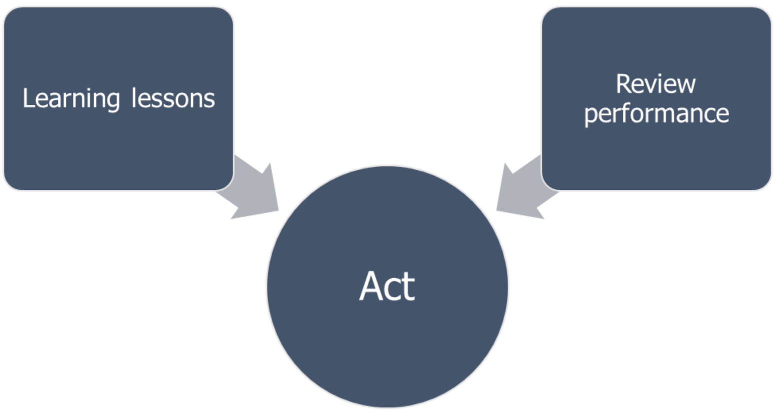

Figure 3-9. The 'Act' stage. Source: HSG65

3.5.3 Other occupational health and safety management standards

The HSG65 is not the only problem-solution system used to mitigate the health and safety challenges. There are other standardised OHSMS developed by public, private and non-public organisations at national and international levels. Robson et al. (2007) mentions the extensive development and dissemination of OHSMS around the world, however, the UK health and safety community is mainly supported by the HSG65, ILO-OSH 2001, OHSAS-18000 and ISO 45001.

3.5.3.1 ILO-OSH 2001

The international level guideline was developed and published by the International Labour Office (ILO) in 2001 with the title "Guidelines on occupational safety and health management systems". The voluntary guideline was developed according to international agreed principles with the objective of protecting workers' safety and health by providing strength, flexibility and appropriate basis to develop a positive safety culture within the organisation (International Labour Office, 2001). Even though the suggested system is not legally binding, it suggests the implementation of a national framework ideally supported by laws and regulations designed to promote the implementation of OSH systems within organisations.

From an organisational perspective, the ILO guidelines encourages the implementation of an OHSMS as part of business management. At the same time, the system attributes the responsibility of a good safety performance mainly to the management line level. However, it clarifies that it remains the responsibility of the employer to comply with legislations. This system does not require a certification; however, it is based on the PDCA management cycle and requires the implementation of the main elements: policy, organizing, planning and implementation, evaluation and action for improvement. Authors from different nations have suggested the adoption and implementation of the ILO-OSH 2011 within the different industries as an instrument to tackle unacceptable health and safety performance (Ruževičius, 2011; Lee, Kim and Kim, 2012; Hiremath et al., 2014; Annan, Addai and Tulashie, 2015). The structure of this system has been summarised in Table 3-2.

Table 3-2. ILO-OSH 2001 structure. Adapted from International Labour Office (2001)

Stages ILO-OSH 2001	H&S practices
Policy	– H&S policy – Worker participation
Organising	– Responsibility and accountability – Competence and training – H&S documentation – Communication
Planning and implementation	– Initial review – System planning – Development and implementation – H&S objectives – Hazard prevention
Evaluation	– Performance monitoring and measurement – Investigation – Audit management review
Action for improvement	– Preventive and corrective action – Continual improvement

3.5.3.2 OHSAS-18000

The Occupational Health and Safety Assessment Series (OHSAS) is an international specification developed by a number of the world's leading national standards bodies, certification bodies, and specialist consultancies, expecting to eradicate the confusion created by the existence of multiple individual schemes. This standard specifies requirements for a H&S management system to enable an organisation to develop and implement a policy and objectives which take into account legal requirements and information about H&S risks. The system structure has been revised over the years and has showed a major impact within organisations. It is considered to be a very successful framework and has gained decent reputation on an international level (Gallagher and Underhill, 2012). In fact, it has been reported that the guideline has been adopted in more than 50k companies in 100 countries (Hasle and Zwetsloot, 2011). In particular, the UK adopted the OHSAS-18001 as a national British Standard in 2007, helping organisations to bring their existing management systems in line with a well-known international guideline. The BS OHSAS 18001 standard is also based on the Plan-Do-Check-Act (PDCA) concept and offers a well detailed process (as shown in Figure 3-10). A detail of each of the tasks to be addressed throughout the process is then presented in Table 3-3.

Figure 3-10. Structure of the OHSAS-18001. Extracted from OHSAS 18001

Table 3-3. OHSAS-18001 structure. Adapted from OHSAS-18001

Stages OHSAS-18001	H&S Tasks
OH&S policy	– Define policy
Planning	– Hazard identification – Risk assessment – Determining controls – Legal and other requirements – Objectives and programme
Implementation and operation	– Resources – Roles and responsibility – Accountability – Authority – Competence, training and awareness – Communication, participation and consultation – Documentation – Operational control
Checking and corrective action	– Performance measurement – Monitoring – Evaluation of compliance – Incident investigation – Corrective action – Control of records – Internal audit

Likewise, the successful acceptance of this structure has caught the attention of academia. Authors have also recommended the implementation of this guideline as a method to encourage a better health and safety performance with organisations (Ruževičius, 2011; Lee, Kim and Kim, 2012; Hiremath et al., 2014).

3.5.3.3 ISO 45001

Even though a variety of guidelines and national standards have guided organisations to address their health and safety risks, there is still a lack of global conformity (BSI, 2016). It is the reason why the International Standards Organization (ISO) had the initiative of harmonizing the different approaches and best practices by developing the first international health and safety standard. The ISO 45001 was published on March 2018 and it is intended to replace the OSHAS 18001 over a three-year migration period.

The ISO 45001 brings a common structure to all management systems, keeping consistency and a common language across all standards. Similar to other guidelines, the management system approach applied in this document is founded on the concept of the PDCA cycle (as shown in Figure 3-11).

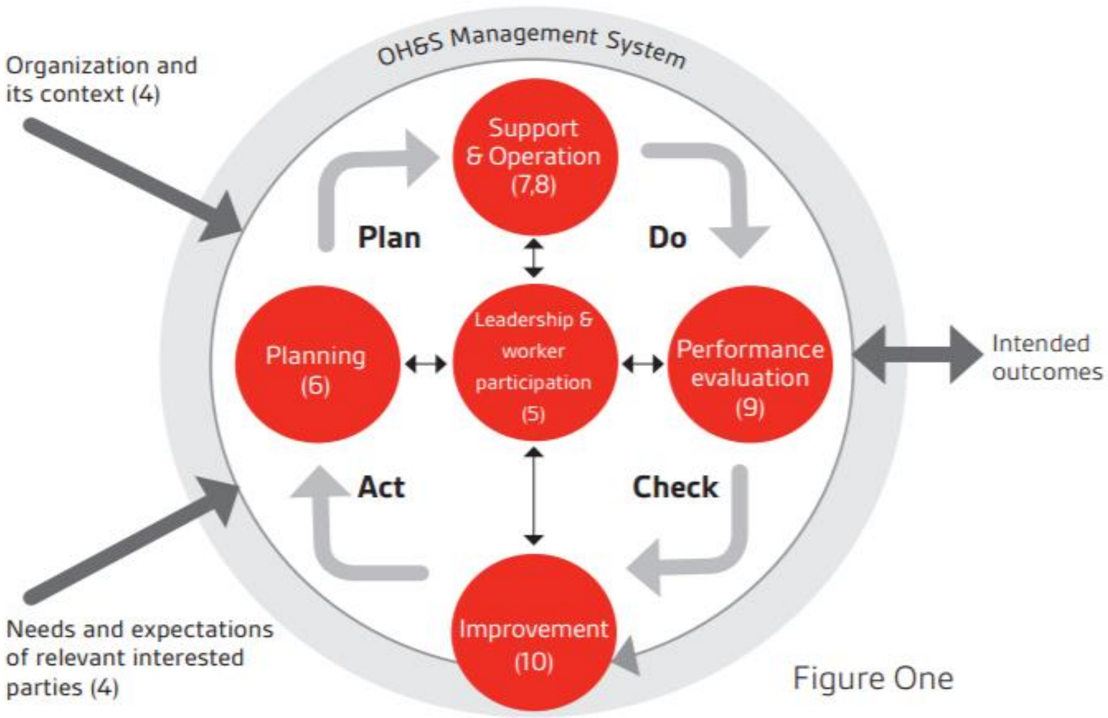

Figure 3-11. Relationship between PDCA and ISO 45001. Extracted from ISO:45001:2008

Table 3-4. ISO-45001 structure. Adapted from ISO-45001

Stages ISO 45001	H&S Tasks
Leadership and worker participation	– Leadership and commitment – H&S policy – Organisational roles, responsibilities and authorities – Consultation and participation of workers
Planning	– Address risks and opportunities – H&S objectives and planning
Support and operation	– Resources – Competence – Awareness – Communication – Documented information – Operational planning and control – Emergency preparedness
Performance evaluation	– Monitoring, measurement, analysis and performance evaluation – Internal audit – Management review
Improvement	– Continual improvement

3.5.3.4 Mapping OHSMS

It can be perceived that the elements of the different OHSMS vary widely in the structures and task requirements. However, the BSI (2016) states that the Plan-Do-Check-Act cycle can be applied to all processes of occupational health and safety management. Table 3-5 illustrates the validation of this view and how the different systems are related to each other.

Table 3-5. Mapping of OHSMS

<table>
<tr><th>HSG65</th><th>ILO-OSH</th><th>OSHAS-18001</th><th>POPMAR</th><th>ISO 45001</th></tr>
<tr><td rowspan="3">Plan</td><td>Policy</td><td>Policy</td><td>Policy</td><td rowspan="3">Planning</td></tr>
<tr><td>Organising</td><td rowspan="2">Planning</td><td>Organising</td></tr>
<tr><td>Planning</td><td>Planning</td></tr>
<tr><td>Do</td><td>Implementation</td><td>Implementation and Operation</td><td>Implementation</td><td>Support and Operation</td></tr>
<tr><td>Check</td><td>Evaluation</td><td>Checking and Corrective Action</td><td>Measuring Performance</td><td>Performance evaluation</td></tr>
<tr><td rowspan="2">Act</td><td rowspan="2">Action for Improvement</td><td>Management Review</td><td rowspan="2">Auditing and Review</td><td rowspan="2">Improvement</td></tr>
<tr><td>Continual Improvement</td></tr>
</table>

3.5.4 Implementation of OHSMS in SMEs

Research on health and safety has mainly concentrated on large organisations (Gray and Sadiqui, 2015). Indeed, it has been reported that large construction companies positively manage health and safety (Arewa, 2014). The vast number of SMEs makes it difficult for enforcing agencies to reach them. The HSE has informed the difficulty to engage with SMEs (HSE, 2007), validating the argument that in the construction sector, the effectiveness of health and safety management systems varies with organisational size.

By nature, small and medium-sized enterprises face many difficulties in complying with health and safety regulations (Kheni, 2008). A study from the HSE (2003) claimed that 71% of SMEs agreed to have a formal safety system in place, compared to an 84% of large organisations. The study also discovered that the SMEs systems were often less comprehensive than large firms. Small organisations tend to view health and safety management as a cost, which limits the commitment to allocate adequate resources into managing health and safety risks (Wright, 1998). Recent literature points out that the financial challenge is one of the primary factors hindering an acceptable health and safety performance in SMEs (Sampaio, Saraiva and Domingues, 2012; Arewa and Farrell, 2012; Arewa, 2014; Wong, Gray and Sadiqui, 2015). However, the debate of the economics behind the commitment to health and safety in construction companies has been characterised as elusive and confusing (Young, 2010). In fact, SMEs spend approximately six times more per employee than large companies to comply with the health and safety requirements (BERR, 2008), what has a direct effect in their economic performance. It has been estimated that the average cost of compliance with health and safety regulations is equivalent to 4-6% of SMEs turnover (HSE, 2005).

The HSE, as the health and safety authority, is aware of the economic challenge, however asserts that improving health and safety practice should be considered an investment as it enhances well-being and productivity. As a matter of fact, Taylor (2010) argues that non-compliance with health and safety regulations leads to accidents which have the potential to cost the equivalent to 30% of company annual profits; also a large social cost. Furthermore, a study conducted by Ikpe et al. (2011) found that cost benefits of compliance with health and safety outweighs the cost of accidents by a ratio of approximately 3:1.

Besides the cost benefits for the SMEs by complying with an acceptable safety system, there are other indirect benefits which could be very important in the development of a business; i.e., reducing absenteeism, improving corporate image, improved job satisfaction, reducing lost time, reducing overtime working, increased productivity (Ikpe, Hammond and Proverbs, 2008; HSE, 2013c).

Managerial and organisational processes in SMEs are less formal, with the level of formality depending on the age and size of the business (Kotey and Slade, 2005).

Activities and operations within small organisations are governed by very few layers of management. The owner-manager role takes responsibility for decision-making and, according to Kheni, Dainty and Gibb (2005), results in no need for formal controls, detailed documentation and procedures. Under these circumstances, SMEs are unlikely to consider the adoption of fully-fledged management system.

The suitability of OHSMS for small businesses have encountered controversy among researchers, giving an indication that an effective health and safety management system that meets the needs of small organisations has yet to be found. Based on this fact, Gallagher, Underhill and Rimmer (2003) defined and developed the concept of Systematic Occupational Health and Safety Management: "A limited number of mandated principles for a systematic management of occupational health and safety, applicable to all types of employers". This type of management is to some extent different from an OHSMS and its basically focused on risks assessments and control, involving the participation of the employees. In fact, some governments admit they are similar in application (Gallagher, Underhill and Rimmer, 2003).

3.5.5 Current Barriers for Implementation of OHSMS

The concern of the effectiveness of the implementation of OHSMS by small and large organisations has led different authors to the identification of current barriers to be considered when adopting any occupational health and safety management system. For instance, Gallagher, Underhill and Rimmer (2003) discussed that there is a lack of awareness of OHSMS in small organisations, in addition to a lack of time and tight project deadlines. Looking into the time barrier, Wong, Gray and Sadiqui (2015) added that good H&S practices require long training and education time for construction firms. Training and induction procedures are often poorly structured in organisations that experience poor safety performance. According to Seppala (1995), a training program helps employees to carry out preventive activities and establish a positive attitude towards H&S. Loosemore and Andonakis (2007) suggested that to improve effectiveness, trainings should be more accessible and by a greater emphasis on changing attitudes and developing skills rather than transferring information.

Implementation costs have also been identified as a main barrier for OHSMS (Gallagher, Underhill and Rimmer, 2003; Sampaio, Saraiva and Domingues, 2012; Wong, Gray and Sadiqui, 2015). These comprise a lack of resources and facilities, financial pressures and lack of negotiation power over main contractors. In addition, Loosemore and Andonakis (2007) reported that cost is largely related to the direct and indirect costs of training, negative impacts on productivity and extra administration. In terms of the organisational level, several concerns are reported to be linked to the resistance and fear to change (Gardner, 2000; Loosemore and Andonakis, 2007; Sampaio, Saraiva and Domingues, 2012). According to Winder (2000), changes resistances are caused by lack of employees' participation and commitment, lack of internal communication and motivation on the implementation process. This is supported by Frick (2011) who reported that OHSMS are often employer dominant with narrow objectives and inadequate feedback from employees and unions.

A summary of the identified barriers for implementing an OHSMS within an organisation is presented in Table 3-6. Addressing these problems is essential to improve the levels of implementation of OHSMS and thereby improve the H&S performance in the construction industry.

Table 3-6. Barriers for implementing an OHSMS within an organisation

Barrier	Authors
Lack of awareness and interest in small businesses	(Gallagher, 2000; Gallagher, Underhill and Rimmer, 2003; Wong, Gray and Sadiqui, 2015)
Weak strategy definition (Objectives, documents development, plan implementation)	(Gallagher, 2000; Gardner, 2000; Gallagher, Underhill and Rimmer, 2003; Sampaio, Saraiva and Domingues, 2012)
Lack of employees' participation and commitment	(Winder, 2000; Gallagher, 2000; Gallagher, Underhill and Rimmer, 2003; Frick, 2011; Sampaio, Saraiva and Domingues, 2012)
Inefficient auditing	(Gallagher, 2000; Gallagher, Underhill and Rimmer, 2003; Sampaio, Saraiva and Domingues, 2012)
Lack of leadership and motivation	(Gardner, 2000; Winder, 2000)
Implementation costs and resource availability	(Gardner, 2000; Loosemore and Andonakis, 2007; Sampaio, Saraiva and Domingues, 2012; Wong, Gray and Sadiqui, 2015)
Time pressure in projects	(Gardner, 2000; Wong, Gray and Sadiqui, 2015)
Resistance and fear to change	(Gardner, 2000; Loosemore and Andonakis, 2007; Sampaio, Saraiva and Domingues, 2012)
Lack of internal communication	(Gardner, 2000; Winder, 2000; Frick, 2011; Sampaio, Saraiva and Domingues, 2012)
The oversight of a pilot phase	(Gardner, 2000)
Inefficient Human Resources	(Sampaio, Saraiva and Domingues, 2012)
Language barriers	(Loosemore and Andonakis, 2007)
Educational barriers	(Loosemore and Andonakis, 2007; Wong, Gray and Sadiqui, 2015)

3.6 Summary

The literature on health and safety management shows that the industries have the access to strategies and tools to reduce the occurrence of accidents in the workplace. Health and safety management and the enforcement authorities rely on the implementation of management systems (OHSMS) in organisations as an approach to improve the health and safety performance.

It has been affirmed that the willingness of adopting health and safety measures is strongly related to the size, management experience and formality in organisation. The discussions in the chapter underline two key issues; the leading role of SMEs in the UK construction industry and the difficulties they present in adoption of health and safety practices. Regarding this issue, a pertinent research question arises:

- Are the UK construction SMEs adopting and implementing any health and safety system or strategy?

The implementation of OHSMS is mostly voluntary, however, the lack of a health and safety system in organisations could lead to catastrophic consequences. Thus, the HSE, acting as the UK health and safety enforcement body, is requiring the use of the law as a strategy to encourage an acceptable improvement. The next chapter discusses the UK legal framework and the effectiveness of the enforcement of the law.

Chapter 4: The UK Legal System and the Corporate Manslaughter and Corporate Homicide Act

4.1 Introduction

In the preceding chapters a review of the health and safety performance of the construction industry was presented, highlighting the need for improvement efforts as an attempt to prevent accidents in the workplace. The legal system is one of the main areas where changes have been made over the years towards improvements in health and safety outcomes in the UK. This chapter presents a review of the UK legal system, particularly the legislations concerning health and safety in the working environment. The chapter begins with an overview of the hierarchy of the UK health and safety legislative framework, outlining the different regulations assigning duties to the relevant parties involved in a construction project. It then introduces the corporate manslaughter legislation along with a review of the successful cases and its implication for construction organisations. This chapter thus addresses in part the first research objective which seeks to develop an understanding of the legal framework behind the health and safety procedures and practices applied in the UK.

4.2 The UK Health and Safety Legislative Framework

The UK has the tradition of using the power of the law to enforce health and safety regulations and encourage an optimist performance for over 150 years. In the construction industry, regulations have been put in place to control activities and address specific problems since the beginning of the 20th century. The elements of the current health and safety system in the UK are established by the Acts of Parliament, along with the influence of the European Union (EU) legislation. The duties mandated in the Acts are then supported by more detailed regulations and codes of practice, constituting a pyramidal hierarchy (Figure 4-1). According to the HSE, the structure of this system has led the UK to have one of the greatest performances in health and safety across the world. Thus, many other countries have adapted the UK legislative model as a basis for developing their own health and safety framework (HSE, 2013a).

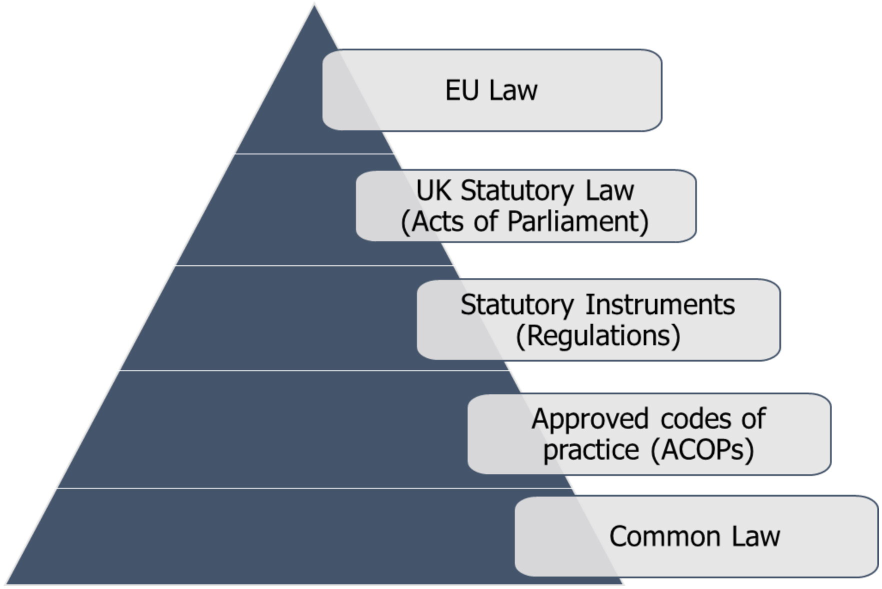

Figure 4-1. UK health and safety legal framework hierarchy. Adopted from Howarth and Watson (2009)

4.2.1 European Union regulations

Since the UK established a health and safety legislative framework before the European Union (EU) was laid down, it is common to find that some of the EU regulations overlap the existent UK framework. Instead of replacing an entire system, the UK government, via the HSE, opted for transposing some of the overlapping EU regulations according to their local needs and requirements (Archer, 2014). Moreover, the HSE (2013) reported that the UK assists and co-operates with the main institutions of the EU in developing and applying international standards, codes and guides. However, it is hard to say whether the UK government has a strong influence in the enacting of the EU Legislation.

A key element of the European occupational safety and health legislation is the health and safety Framework Directive (89/391/EEC). This was primarily implemented in the UK by the Management of Health and Safety at Work Regulations 1999 which stablishes broadly based obligations for employers to evaluate, avoid and reduce workplace risks. In addition to this framework, a range of related and other directives are implemented through national regulations covering:

- The management of specific workplace risks such as musculoskeletal disorders, noise, work at height or machinery;
- The protection of specific groups of workers such as new or expectant mothers, young people and temporary workers;
- Measures to complete and maintain the single market in the EU; and
- The protection of the environment.

Despite the EU regulations being in place, the main primary regulation for the health and safety system in the UK is the Health and Safety at Work Act. The following subsection provides a summary of the conception and development of this Act.

4.2.2 The ruling Health and Safety at Work etc. Act 1974

Health and safety statutes have been existing for over two hundred years but being always inflexible and prescriptive. In the UK, the construction regulations of 1961 and 1966 which were made under the Factories Acts of 1937, 1948 and 1961 primarily provided H&S control of activities. This however did not provide guidance on H&S management which has been discussed to have a significant influence on the safety performance of industries. The rulings were reactive rather than proactive and tended to be designed for plant and equipment to be safe rather than the development of parallel arrangements for raising the H&S awareness of employees (Hughes and Ferrett, 2008). Due to the continuous increment of the accident rate, the government made the decision of carrying out a general review of health and safety which they called 'The Robens Report' (1972). The report recommended to base the law on principles instead of prescriptions and, at the same time, it recommended to embrace all industries in a single Act. This marked a new era in health and safety regulations, as it led to the enactment of the Health and Safety at Work Act (HSWA) in 1974. Perry (2003) pointed out that the Act sets out the general parameters of what is expected of employers and other persons in respect of ensuring their health, safety and welfare as far as reasonably practicable. The main difference between the HSWA and all preceding H&S regulations is the emphasis placed by the Act on individuals and their duties rather than on the place of work (Joyce, 2015). The duties imposed by the HSWA cover:

- employers towards employees;
- employers towards persons other than employees;
- people in control of non-domestic premises;
- manufacturers, designers and suppliers; and
- employees.

In the same Act, the Health and Safety Executive (HSE) was created as the enforcement body for health and safety law. Nowadays, the HSWA is considered of over-riding importance and is the focus of all health and safety statutory law in the UK (Joyston-Bechal and Grice, 2004). In fact, this Act is an Enabling Act which allows the Secretary of State to make further laws known as regulations without the need to pass another Act of Parliament. It is important to highlight that aside the HSWA there are other primary legislation such as the Health and Safety (Offences) Act 2008 and the Corporate Manslaughter and Corporate Homicide Act 2007.

It has been argued that a significant portion of the ability to influence the H&S performance of the construction industry resides at the planning and design stage where professionals make crucial decisions (Brabazon, Tipping and Jones, 2000). The Health and Safety Commission created a series of regulations as an instrument to enforce the law within the industry. When looking at the existing regulations, the most prominent from a management perspective could be considered to be the Management of Health and Safety at work Regulations 1999 and the Construction (Design and Management) Regulations (CDM) 2015. These regulations are studied in the following subsections.

4.2.3 The management of Health and Safety Regulations 1999

This Statutory Instrument is one of the most important health and safety legislation to come into force since the HSWA. It was first introduced in the 1980s to stem the tide of rising accidents, which was thought to be a function of the fact that the HSWA failed to require explicitly that employers should develop effective safety management systems (Joyston-Bechal and Grice, 2004). These regulations provide guidance on the general duties and obligations that employers have to their employees and third parties. Guidance on the responsibilities that employees have to themselves and their colleagues is also provided.

One of the main requirements of these regulations on employers and self-employed persons is to carry out risk assessments. The employer must identify the hazards to the health, safety and welfare of his employees and persons not within his employment arising from his operations. This information will affect their decisions on how to manage the risks, ensuring they are made in an informed, rational and structured manner and the action is proportionate to the risk. Practical steps on assessing risks are provided in the HSE Guidance document INDG163 (rev4) (HSE, 2014a). The regulations also require employers to appoint one or more competent persons to advise and assist in complying with the statutory health and safety duties. In addition, employers must cooperate and coordinate their health and safety procedures and information with other employers sharing a worksite. Amongst other further duties, employers must provide their employees with suitable and sufficient information and training on the risks identified in their assessments, the measures implemented to reduce those risks; and the identity of the appointed competent person (Joyston-Bechal and Grice, 2004).

4.2.4 The Construction Design and Management regulations (CDM) 2015

The Construction Design and Management Regulations (CDM) create specific duties for clients, principal designers, designers, principal contractors, contractors and workers with the common aim of achieving acceptable levels of health and safety during construction. These regulations are considered as the most far-reaching and relevant legislation in terms of H&S in construction (Bomel Limited, 2007). The regulations first came into force in 1995 to implement the Temporary or Mobile Construction Site Directive adopted by the European Council in 1992. This Directive has been drafted in response to research which indicated that poor management of a construction project, in particular, poor training, communication and planning, were directly related to levels of safety on a construction site. They therefore detail the minimum standards of health and safety at temporary or mobile construction sites, forcing employers to become part of a health and safety management system.

The 1994 version of the CDM regulations underperformed in terms of competence assessment, fostering teamwork, and clarification of duties (Bomel Limited, 2007). To this end, the regulations were succeeded by the Construction (Design and Management) Regulations 2007 which aimed to integrate health and safety into the management of the projects right from the early stages of projects. The latest version was published in 2015, requiring a generic framework suitable to embed the principles and legislations at the smaller end of the industry (Cash, 2015). As part of their duties, duty holders are required to produce or complete vital documents such as the F10 Notification Form, Construction Phase Plan and the H&S File. Although it is expected that modifications to the regulation address observations and issues, the failure to properly understand the CDM regulations in the construction industry is a continuous problem. Lack of clarity in the CDM regulations 2015 has been reported by Manu et al. (2017) and Mantell (2018).

One of the main changes introduced in the new regulations was the removal of the role of CDM coordinator, and the new role of principal designer was defined. It was intended that this role would be assumed by the architect or lead engineer in the construction project. However, practitioners have reported that these professionals have proved reluctant to take on the new role directly, often discharging their duties by hiring a CDM adviser. In effect, this reportedly adds cost without achieving the aims of the regulations (Mantell, 2018). Building Information Modelling (BIM) is considered a tool that may significantly contribute to this problem and complement the discharge of CDM obligations (Mzyece, Ndekugri and Ankrah, 2019).

4.2.5 Other Acts, regulations and orders

The HSWA, the Management of Health and Safety Regulations 1999 and the CDM Regulations 2015 are not the only legal obligations to be complied by the construction industry. There exists a wide range of particular health and safety regulations that apply to construction projects. Some of the regulations that can be applied to the construction industry are illustrated in Figure 4-2.

Figure 4-2. Illustration of examples of H&S legislation in the UK

4.2.6 The role of Health and Safety Executive

The Health and Safety Executive (HSE) is the authority in charge of enforcing health and safety laws in the construction industry. It was established in the HSWA 1974 which states the general duties as follow:

- assist and encourage persons concerned with matters relevant to the operation of the objectives of the Health and Safety at Work etc. Act 1974;

- make arrangements for and encourage research and publication, training and information in connection with its work;
- carrying out targeted inspections and investigations;
- taking enforcement actions to prevent harm and hold those who break the law to account;
- make arrangements for securing government departments, employers, employees, their respective representative organisations, and other persons are provided with an information and advisory service and are kept informed of, and adequately advised on such matters; and
- propose regulations.

The HSE acts as an enabler, supporting businesses, particularly SMEs, by providing simple, accessible and relevant advice. The latest strategy for the HSE, *Helping Great Britain Work Well*, was published in 2016 and is focused on 6 priority themes over the following 5 years that are believed to bring a renewed emphasis on improving health in the workplace, as well as building on the highly successful track record on safety (HSE, 2016b). These themes are reportedly to be:

- Acting together: promoting broader ownership of health and safety in Great Britain.
- Tackling ill health: highlighting and tackling the cost of work-related ill health.
- Managing risk well: simplifying risk management and helping business to grow.
- Supporting small employers: giving SMEs simple advice so they know what they have to do.
- Keeping pace with change: anticipating and tackling new health and safety challenges.

- Sharing success: promoting the benefits of health and safety system of Great Britain.

It has been presented during this work that the UK is ruled by the EU regulations. The UK however have opted to exit the EU and by the time of writing this report, a deal had not been established. Despite this, the HSE has indicated that the health and safety protections and the duties to protect the health and safety of people will not change with Brexit. They have made minor amendments to regulations to remove EU references but legal requirements, and the protections these provide will remain the same as they are now (HSE, 2019).

4.3 Corporate Manslaughter and Corporate Homicide Act 2007: The Concept of the Act

In addition to the HSWA, the Corporate Manslaughter and Corporate Homicide Act 2007 (CMCHA) is a primary legislation within the UK legal system which aims to enhance the H&S performance within organisations. It was passed with the intention of improving the law on corporate criminal liability for poor health and safety management. Details regarding this Act are discussed in the following subsections.

4.3.1 The concept of corporate manslaughter

4.3.1.1 Gross negligence manslaughter

The offence of manslaughter can be committed by an individual when a charge of murder is reduced to voluntary manslaughter or when the individual had no intention to kill/injure but was guilty of reckless or gross negligence (Joyston-Bechal and Grice, 2004). The legal test for gross negligence manslaughter was conceptualised in *R v Bateman [1925]* as a conduct that showed such disregard for the life and safety of others as to amount to a crime against the state and conduct deserving of punishment. The offence of gross negligence manslaughter has been the subject of significant criticism (Mullock, 2018). This criticism is particularly because liability for a very serious offence may be found in the absence of intention or recklessness. Manslaughter charges are investigated by the police and prosecuted by the Crown Prosecution Service by proving beyond reasonable doubt that the defendant (i) owed a duty of care to the person who died, (ii) the defendant breached that duty, (iii) the breach was one of the causes of death; and (iv) the breach was so grossly negligent that the defendant deserves criminal sanctions: *R v. Adomako* [1990] 1 AC 171. Applied to the construction industry, a manager or supervisor of a construction operation may be convicted for gross negligence manslaughter depending upon the degree of incompetence with which the relevant operation was managed and the nature of the causal link between individual management failure and the death (Ndekugri, 2011).

4.3.1.2 Corporate manslaughter in the English common law

A company could also be prosecuted for common law gross negligence manslaughter, but since the offence has been developed for the prosecution of individuals, it is notoriously difficult to convict companies other than small organisations (Joyston-Bechal and Grice, 2004; Ndekugri, 2011). To convict an organisation of this criminal offence, it is necessary to apply the 'identification principle' which requires the identification of a guilty individual at a senior level in the company in two stages: (i) identify an individual within the organisation who could be convicted for manslaughter; and (ii) prove that the individual represented the directing mind or the organisation at the relevant time. According to Joyston-Bechal and Grice (2004), it is this second stage that makes it so difficult to convict a large organisation, where the directors or senior managers are not solely responsible. In regard to the difficulty to prosecute large organisations, Jacobs (2007) added that courts are reluctant to find any senior figure who is a controlling mind or find a lower level figure at fault who is a controlling mind. It is thus unsurprising that there have been only a handful of successful prosecutions for corporate manslaughter.

4.3.1.3 The proposed new offence of corporate manslaughter

With the introduction of the HSWA, accidents causing fatalities and injuries could be penalized for gross negligence as long as a controlling mind, whether an individual or a corporation, could be identified (see Section 4.3.1.2). However, it took twenty years for the first company to be convicted for manslaughter. OLL Limited (1994) was found guilty when its director was identified as the only employee liable for the organisation's actions. Since then, a few more small companies have been convicted for manslaughter even though numerous cases have been prosecuted. Significantly, large companies involved in catastrophic cases, such as the Herald of Free Enterprise (1987), managed to escape conviction due to the difficulty of the identification principle in a complex organisational structure.

The case of the Herald of Free Enterprise (1987) and several other unsuccessful cases involving large companies; Kings Cross Fire (1987), Piper Alpha Oil Disaster (1988), Marchioness Disaster (1989), led to the consideration of law reform commencing in 1994. The Law Commission reported in 1996 that a new offence of manslaughter must be created for corporations, but this time without the identification requirement, which would build an easier path for the prosecution process (Law Commission, 1996).

4.4 Corporate Manslaughter and Corporate Homicide Act 2007

4.4.1 Enactment of the new offence

The proposal of a new offence of corporate manslaughter culminated in the introduction of the Corporate Manslaughter and Corporate Homicide bill in the House of Common on July 2006 becoming an Act on July 2007 (Corporate Manslaughter and Corporate Homicide Act 2007, hereafter CMCHA) after being slowly developed for thirteen years as remarked by Gobert (2008).The main intention of the Act is to be able to prosecute without any barriers all sorts of organisations where there have been management failures resulting in the death of an individual (Ministry of Justice, 2007).

The Act details a set of ingredients to define a conviction for the offence: (i) A duty of care exists in respect of an employer's duty to provide a safe working environment for his employees and others, to provide safe and suitable equipment, to supply safe products and services to others (section 1(1) and section 2); (ii) gross breach of that duty i.e. organisation's conduct must have fallen far below what could have been reasonably expected through failure to comply with any health and safety legislation that relates to the alleged breach, or evidence that shows that there were attitudes, policies, systems or accepted practices within the organisation that were likely to have encouraged or produced tolerance of any such failure (section 1(1) and section 2); (iii) a substantial element of the gross breach derives from management failure at senior level (section 1(3)); and (iv) the breach causes a person's death (section 1(1)).

The Code for Crown Prosecutors (CPS, 2013) gives guidance to prosecutors on the general principles to be applied when making decisions about bringing prosecutions under this Act. It notes that there must be sufficient evidence to provide a realistic prospect of conviction. The number of prosecutions is, therefore, a barometer of the ease of assembling such evidence which is reliable, credible and can be used in court.

4.4.2 The sentencing guidelines

The sentencing criteria is normally based on the company circumstances and their turnover as mandated by the Sentencing Guidelines in force at the date of the conviction (SGC, 2016). The Sentencing Guidelines Council first suggested a minimum conviction fine of £500,000 (SGC, 2010). Instead, companies were sentenced to a widely varying range of fines and, in most of the cases, less than that suggested by the guide. Consequently, there were criticisms of the poor structure of the guideline in relation to the economic impact of the sentences for the organisations (Davies, 2010; Haigh, 2012). This criticism forced revision of the guideline (SGC, 2016), which was immediately applied to the Monavon Construction case. The most recent construction case resulted in a sentence of a £500,000 fine, which presumably would have a more significant impact on the convicted organisation (Downey, 2016). The new guideline ensures a more proportionate system with other guidelines, and it is intended to be more aligned with the financial means of the offender (SGC, 2015). In this case, the new range of monetary fines is given by a classification of the organisations according to the seriousness of the offence and their annual turnover, suggesting a starting point of £300,000. Quite clearly therefore, the size of the company has a direct influence not just in prosecution and conviction but even in the fines imposed and how they are paid up (Field and Jones, 2015).

4.4.3 Prosecutions, convictions and sentences

Since the Act came into force on the 6th of April 2008, a small proportion of fatalities have resulted in a prosecution under the Act. According to the CPS (2016), less than thirty cases have been considered for prosecutions from 2008 to 2016. This is equivalent to only three percent of the fatalities of employed workers over the same period of time. Although the prosecutions follow an increasing trend over the passing years, they still appear insignificant when compared with the numerous fatalities occurring each year. However, the positive aspect is that the cases which do reach the courts are most likely to result in convictions, with nearly 100 percent effectiveness each year.

By 2016, twenty-one UK registered companies from different sectors and industries had been convicted for corporate manslaughter (these are shown in Table 4.1). Fifteen of these cases had the prosecuted enter guilty pleas, with only six going to trial. Since prosecution of cases entails a long process in the courts, the first conviction took place three years after the Act had legal effect. The conviction of Cotswold Geotechnical Holdings in 2011 for corporate manslaughter after a fatality in the workplace raised expectations as to the effectiveness of the CMCHA legislation.

It is significant to note that there is evidence that the authorities not only pursue organisations for a corporate manslaughter offence, but also, the management team (owner, director, project manager) is likely to be prosecuted by alternative routes of prosecution, generally under sections 2, 3, 7, 36 and 37 of the HSWA (1974). According to the Act, the liability of the management team relies on how aware the person in charge was regarding the risk which caused the fatality. Successful prosecution results in high monetary fines and long periods of imprisonment.

Table 4.1. Successful convictions under CMCHA until 2016 (CPS, 2016)

Company	Place and Year of Conviction	Nature of Business	Fine (plus costs)
1. **Cotswold Geotechnical Holdings**	England (2011)	Engineering Activities	£385,000
2. **J M W Farm Limited**	Northern Ireland (2012)	Raising of swine/pigs	£187,500
3. **Lion Steel**	England (2012)	Manufacture of office machinery and equipment	£480,000
4. **J Murray and Sons**	Northern Ireland (2013)	Other business support service activities	£110,000
5. **Princes Sporting Club**	England (2013)	Activities of sport clubs	£135,000
6. **Mobile Sweepers Limited**	England (2014)	Other building and industrial cleaning activities	£12,000
7. **Cavendish Masonry**	England (2014)	Development of building projects	£237,000
8. **Sterecycle Limited**	England (2014)	Treatment and disposal of non-hazardous waste	£500,000
9. **Diamond and Son**	Northern Ireland (2014)	Sawmilling and planning of wood	£90,000
10. **Peter Mawson Limited**	England (2015)	Other building completion and finishing	£220,000
11. **Pyranha Mouldings**	England (2015)	Manufacture of other plastic products	£200,000
12. **CAV Aerospace**	England (2015)	Manufacture of air and spacecraft and related machinery	£725,000
13. **Nicole Enterprises**	Northern Ireland (2015)	Recreational vehicle parks, trailer parks and camping grounds	£100,000
14. **Kings Scaffolding**	England (2015)	Scaffold erection	£300,000
15. **Huntley Mount Engineering**	England (2015)	Other manufacturing not elsewhere classified	£150,000
16. **Linley Development**	England (2015)	Construction of commercial buildings	£225,000
17. **Baldwins Crane Hire**	England (2015)	Other construction activities not elsewhere classified	£900,000
18. **Cheshire Gates and Automation**	England (2015)	Security systems service activities	£50,000
19. **Sherwood Rise**	England (2016)	Non-trading company	£300,000
20. **Monavon Construction**	England (2016)	Construction of commercial buildings	£500,000
21. **Bilston Skips**	England (2016)	Other business support service activities not elsewhere classified	£600,000

4.4.4 The cases of construction organisations

From the twenty-one convictions under the new corporate manslaughter act, seven organisations have a construction related business activity as reported to the Company House (Table 4.2). With this in mind, it can be stated that the construction industry accounts for 30 percent of the convictions under this law. This proportion represents a similar figure when compared to the 30 percent of all fatalities to workers attributable to the industry (HSE, 2015b).

Table 4.2. Convictions of construction related organisations under the UK corporate manslaughter and corporate homicide act 2007.

Organisation Name	Fine (plus costs)	Annual Turnover (£)	Cause of Death
Cotswold Geotechnical Holdings	£385,000	< 6.5 m	Trapped by collapse
Cavendish Masonry Limited	£150,000	< 6.5 m	Struck by object
Peter Mawson Limited	£200,000	< 6.5 m	Fall
Kings Scaffolding	£300,000	< 6.5 m	Fall
Linley Development	£200,000	< 6.5 m	Trapped by collapse
Baldwins Crane Hire	£700,000	20 m	Vehicle
Monavon Construction	£500,000	< 6.5 m	Fall

These convictions cut across the spectrum of construction activities from groundworks and general building activities to specialist activities such as scaffolding and the operation of construction plant.

4.4.5 Controversy on the Act

The introduction of a new offence in any legal system is always challenging. In the case of the corporate manslaughter legislation in the UK, various points were hotly debated in the long period of consultation before the Act was introduced. The Act was generally welcomed at its inception, yet many experts were critical of what they perceived was an unnecessary complexity. According to Roper (2018), the Act has not been the failure some experts predicted, but at the same time, the reform has not been as radical as many hoped to be. However, the number of prosecutions each year has fallen short of what was projected. The small number of prosecutions overall may imply some inherent difficulties with the application of the law or that there are easier options for securing convictions for health and safety offences. The evidence however suggests an upward trend in the number of prosecutions during the past five years. In 2015, nine cases resulted in conviction, which is a 225 percent increase when compared to the previous year.

However, the Act will only be properly tested when large companies with complex management structures and whose directors are on the top of the structural hierarchy are successfully convicted. The Grenfell Tower fire has engrossed the public and renewed the debate about corporate manslaughter and the ability of the law to prosecute organisations and individuals accountable for such type of disasters. It can therefore be inferred that a lack of familiarity with this law could have accounted for its slow application. However, these issues are speculative and require further research to unearth the real causes of the arguably limited application of the CMCHA.

4.5 Summary

This chapter presented an overview of the health and safety legal framework in the UK. Amongst the different legislations to enforce health and safety in the workplace, the Health and Safety at Work Act 1974 is the focus of all statutory law in the UK. This Act outlines the general principles which underlie all other health and safety regulations. In addition to this Act, a new offence of corporate manslaughter was introduced as an attempt to make it easier to prosecute large organisations after a fatality in the workplace. Among the successful cases under this Corporate Manslaughter and Corporate Homicide Act, the construction industry was accountable for over 30 percent of the convictions. However, the enactment of this legislation has generated controversy on its effectiveness as SMEs have mainly become the objects of prosecutions rather than large organisations. It is therefore necessary to assess how this Act and its potential consequences to an organisation has influenced the way construction SMEs currently manage health and safety in the workplace. Figure 4-3 presents the summary of the literature review findings along with the research methodology proposed to provide answers to the sought research questions.

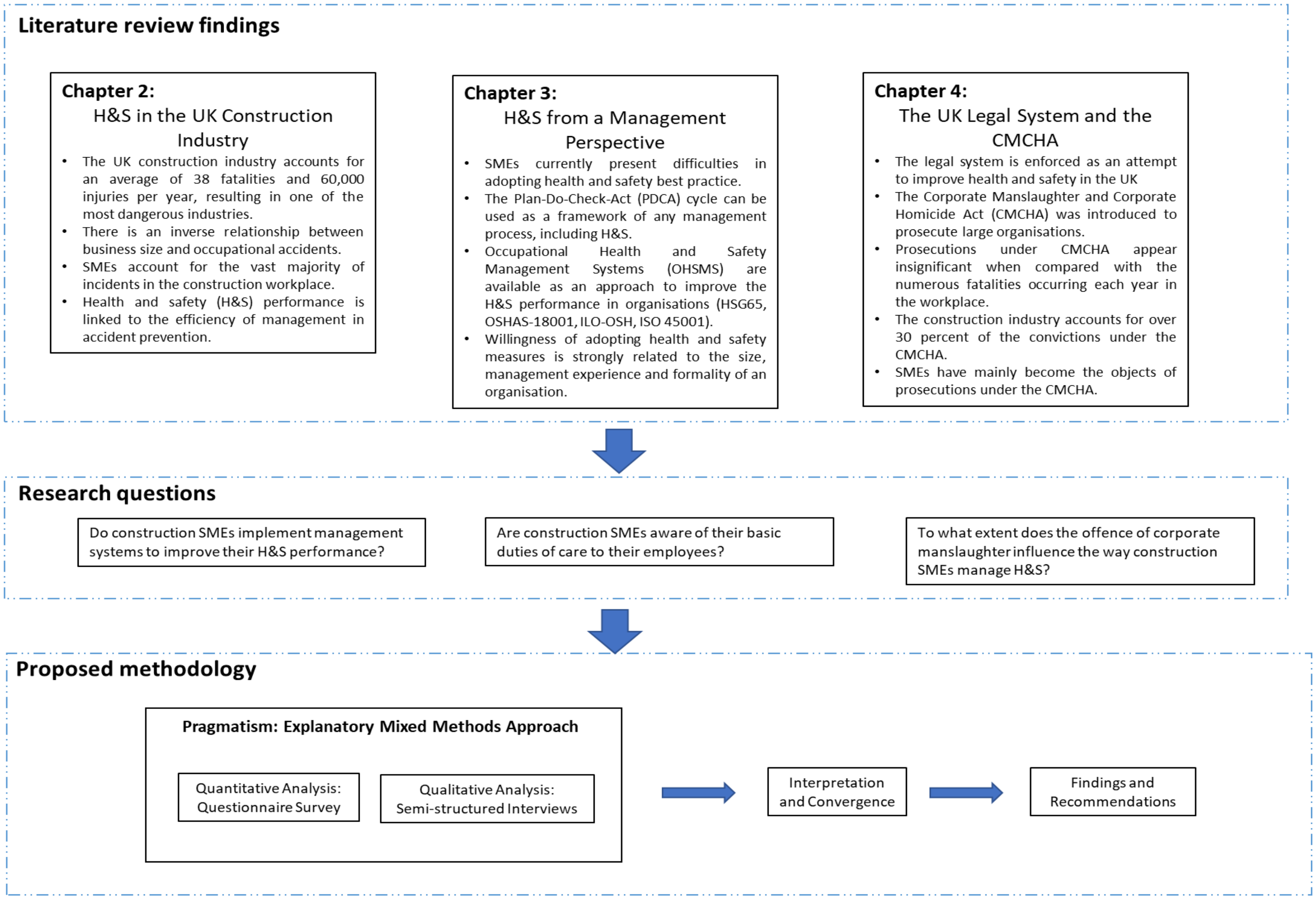

Figure 4-3. Summary of literature review finding and proposed methodology

Chapter 5: Methodology

5.1 Introduction

This chapter presents the research methodology adopted to achieve the aim and objectives of this research which in this case is mainly a quantitative methodology incorporating some aspects of a qualitative approach. The justification for adopting this approach and the methods applied to collect data are also presented. Moreover, this chapter looks at the process and tools employed in the organisation and analysis of the data to assess the level of implementation of a H&S management system in construction SMEs and the influence of the legislation on the way they manage H&S.

5.2 Theory of Research Methods

The world consists of knowable facts that could be revealed by implementing the correct research methodology, ask the ideal questions and carry out the right experiments (Wisker, 2008). Considering that a research methodology questions and develops the aim and objectives of a research study (Naoum, 2013), it is then important to ensure that the appropriate research strategy is applied. Kumar (2014) explains that it consists of the detailed plan to be followed during the research journey in order to find answers to the research questions as validly, objectively, accurately and economically as possible. It is also a mean for the researcher to communicate to others regarding the decision on the proposed design, how the data will be collected, the selection of the sample, the analysis of the data and the diffusion of the results.

The literature on research methods suggests three main types of research design; qualitative, quantitative and mixed (Creswell, 2014; Kumar, 2014). The choice of methods rests on certain claims such as the level of flexibility permitted to the investigator, the purpose of the study and the type and availability of data (Kumar, 2014). In choosing the appropriate research approach, Creswell (2014) proposed the intersection of three elements: (i) philosophical worldview assumption, (ii) research designs related to the worldview and (iii) specific methods. Creswell's (2014) framework (as shown in Figure 5-1) served as a guide to choose the appropriate research design for this study. In the following sections, the elements of this framework are reviewed in relation to this study.

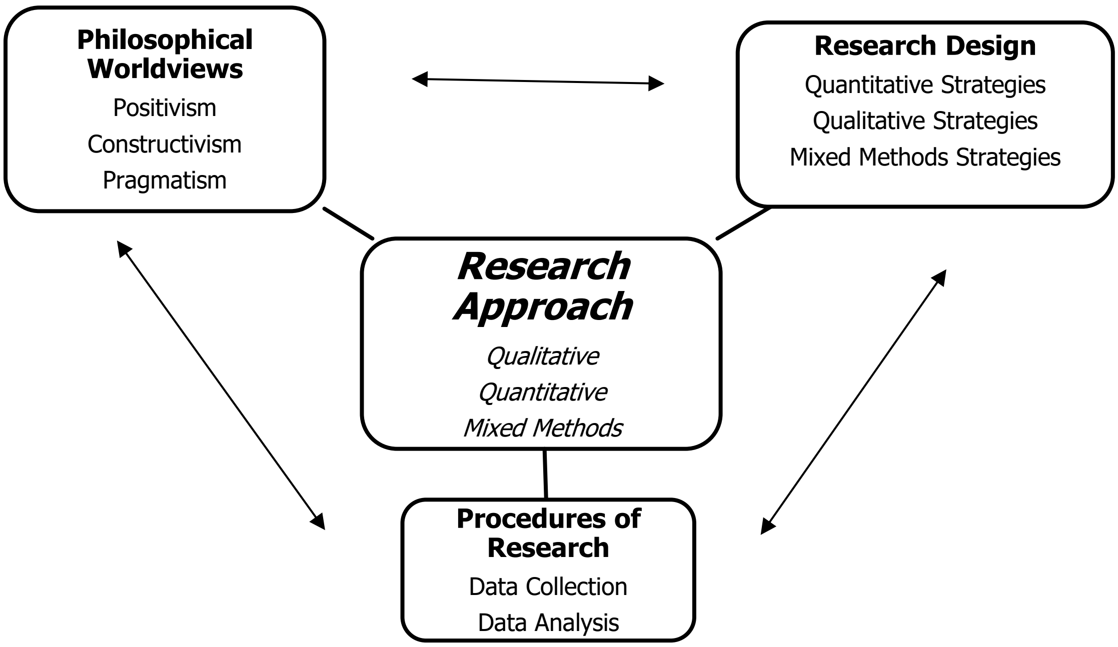

Figure 5-1. Creswell's framework for research design

5.2.1 Philosophical worldviews

The term worldview is used by Creswell (2014) as meaning "a basic set of beliefs that guide actions" (Guba, 1990). Others choose the terms paradigm, epistemologies and ontologies to refer to philosophical worldviews. Ponterotto (2005) defines paradigm as "a set of interrelated assumptions about the social world which provides a philosophical and conceptual framework for the organized study of that world". It is believed that philosophical beliefs have significant influence in the adoption of research strategies (Ponterotto, 2005; Creswell, 2014) and as such need to be identified (Creswell, 2014).

The two dominant philosophical worldviews are positivism and constructivism (Guba, 1990; Ponterotto, 2005; Kumar, 2014). Positivism adheres to the objective belief that there exists a singular reality and is driven by immutable natural laws and mechanisms (Guba, 1990). Positivists embrace the *cause-effect* philosophy, which reflects the need to identify and assess the causes that influence outcomes of problems (Creswell, 2014). Conversely, constructivism or interpretivism assumes a relativist position in which realities are multiple and are constructed in the mind of the individual, rather than being an externally singular entity (Guba, 1990; Hansen, 2004; Ponterotto, 2005). The ideas of positivism are based in observation and numeric measurement of proposed hypotheses (Creswell, 2014), while constructivism establishes subjective dialogue interactions with individuals to jointly produce the findings of the problem (Ponterotto, 2005).

More recently, pragmatism has shown an increase in its implementation in research studies as a third worldview. According to Cherryholmes (1992), pragmatism insists upon consequent phenomena and therefore results out of actions, situations, and consequences rather than the antecedent phenomena adopted in positivism. The practice of pragmatism focuses on the size of the problem and therefore considers any available tools to achieve the desired outcome. In simpler words, pragmatists are not committed to any philosophical system but have a freedom of choice of research approaches.

These philosophical worldviews are aligned to the different research strategies previously mentioned. For instance, quantitative research is developed under a positivist philosophy, while qualitative studies are aligned with a constructivist worldview (Cherryholmes, 1992; Creswell, 2014; Kumar, 2014). Lastly, pragmatism gives the freedom in the choice of methods, techniques and procedures of research, constituting the views of a mixed methods approach (Creswell, 2014).

5.2.2 The qualitative approach

The qualitative approach is rooted in the philosophy of constructivism and follows an open, flexible and unstructured approach. According to Creswell (2014), it is focused on exploring and understanding the reaction of individuals or groups to a social or human problem. Qualitative designs mainly aim to discover diversity rather than quantifying, emphasising in the description of the feelings, perceptions and life experiences of the selected sample. To carry out this approach, researchers tend to collect four different types of data: interview data, observations data, document data and audio-visual data. The data tends to be collected using interviews, focus groups or observation and usually analysed by means of text and image analysis. Following the inductive style of this form of research, the interpretation of the data is communicated in a flexible narrative and descriptive structure.

The main attributes of qualitative research have been summarised by Denzin and Lincoln (2011) and discussed in the work of Harrison et al. (2017) as: reducing the use of positivism, accepting postmodern sensibilities, securing rich descriptions of a phenomena, examining the constraints of life and capturing the individual’s point of view.

Despite the wide acceptance of the qualitative approach in educational research, its value is frequently questioned. There are some who argue that qualitative research is of poor standard but, more usually, the complaint is regarding the uncertainty of the quality of qualitative results (Hammersley, 2007). Bryman (2016) goes further into the critique and highlights the most common criticisms as:

- being impressionistic and subjective as the findings will rely on the researcher's view of the problem;
- the studies are difficult to replicate since there are hardly any standard procedures to be followed;
- problems of generalisation because the scope of qualitative investigations is restricted; and
- lack of transparency due to the difficulty which sometimes arises from identifying what the researcher actually did and how the conclusions were arrived at.

Taking into account the criticism, Chowdhury (2015) recommended the use of different sources and tools to ensure the quality of qualitative strategies. Moreover, Bryman (2016) added that the reliability of the findings can be achieved by implementing strategies which make the studies easy to replicate.

The qualitative methodology can be approached by different research strategies. In his book, Creswell (2014) presented the five most commonly used designs: narrative research, phenomenological research, grounded theory, ethnography and case studies, which are discussed below.

5.2.2.1 Narrative Research

Narrative research is the qualitative design in which the researcher is interested in the lives of individuals and is focused on the storied nature of human conduct (Spector-Mersel, 2010). The researcher using a narrative approach asks individuals to provide stories about their lives and the result is presented as a narrative chronology (Creswell, 2014).

5.2.2.2 Phenomenological Research

The phenomenological design is a mix of philosophy and psychology focused on the reflective study of pre-reflective experience. This means that the researcher is oriented to life as the participants experience it, taking into account the contexts of language, culture, science, politics and ideologies (Adams and van Manen, 2017). Phenomenological research is also described as the source for questioning the meaning of life as we live it and the nature of responsibility of personal actions and decisions (Van Manen, 2016).

5.2.2.3 Grounded Theory

Grounded theory is a sociology-oriented design in which the researcher explains what is happening by deriving a general theory of a process, action or interaction grounded in the views of the participants (Creswell, 2014). Harris (2015) agrees that grounded theory is suited to those areas which have not been examined. She also states that instead of providing descriptive accounts of the subject matter, as the other options do, this research design seeks an explanation of the phenomenon.

5.2.2.4 Ethnography

Ethnography is a sociological approach in which the researcher studies the shared patterns of behaviour, social interactions, perception, language, and actions of an intact cultural group, team, organisation or community over a prolonged period of time (Reeves, Kuper and Hodges, 2008; Creswell, 2014). It is the preferred approach to understand social action and its subtleties in different contexts.

5.2.2.5 Case Studies

Case studies are designed to develop an in-depth analysis of a case, a program, event, activity or process (Creswell, 2014). Case studies have a particular versatility which allows the enquirer to decide from different methodological or philosophical orientations to conduct a study, the approaches could be either quantitative or qualitative orientated (Harrison et al., 2017).

5.2.3 The quantitative approach

The quantitative approach, in contrast to the qualitative approach, is rooted in a rationalism philosophy and follows a rigid, structured and predetermined set of procedures to achieve the objectives of the studies (Kumar, 2014). Quantitative research aims to quantify the extent of variation in a phenomenon emphasizing in the measurements of variables and presenting the finding in an analytical and aggregate manner (Kumar, 2014). Regarding this approach, Creswell (2014) provides a simpler definition and states that quantitative research is an approach for testing objective theories by examining the relationship among measured variables.

There are four different types of data which researchers tend to collect in quantitative studies: performance data, attitude data, observational data and census data. To obtain this data, researchers are aided by instruments such as questionnaires and calibrated equipment and then use statistical methods to reach to conclusions. Considering that validity and reliability of the findings are important features for this approach, the samples collected are often large and representative (Kumar, 2014). In contrast with a qualitative approach, the findings of a quantitative study can be generalised and easily replicated.

The quantitative research approach has however received criticism from researchers. Bryman (2016) addressed some of these arguments:

- researchers using a quantitative approach fail to distinguish people and social institutions from the world of nature;
- the measurement process has been accused of possessing an artificial and false sense of precision and accuracy;
- the reliance on instruments and procedures hinders the connection between research and everyday life;
- the variable analysis creates a static view of social life that is independent of people's lives.

Creswell (2014) noted that the two prominent quantitative strategies are survey and experimental research. These are briefly discussed below.

5.2.3.1 Survey Research

Survey research provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of the population (Creswell, 2014). Alreck and Settle (2004) argued that surveys are often conducted as they can be an easier, quicker, more accurate and less expensive way to get the information required within a study. According to Fowler (2009), self-administered questionnaires or structured interviews are used as the instruments for collecting data with the intent of generalising from a sample to a population. A survey research tends to focus on structured questions, in which the researcher intends to standardise the answers to reduce errors and increase the accuracy of processing the data. Self-administered questionnaires and structured interviews are remarkably similar, meaning that the decision of selecting the suitable approach should consider the evaluation of different aspects, such as cost, time, response rate, variability, and convenience.

5.2.3.2 Experimental Research

Experimental research can be viewed as an alternative to surveys (Bryman, 2016) when the inquirer seeks to determine if a specific action influences an outcome (Creswell, 2014). It is assessed by providing a specific treatment to one group and withholding it from another and then determining how both groups scored on an outcome. Unlike survey research, an experimental approach allows behaviour to be observed directly.

5.2.4 The mixed approach

The mixed approach leads to a combination of two or more methods to collect and analyse data pertaining to a research problem. Mixed method is considered relatively novel as it was originated in 1959 when Campbell and Fisk used multi-methods to study validity of psychological traits (Creswell, 2014). The idea is to take advantage of the strengths of the quantitative and qualitative methods and neutralise the biases. The mixture of methods is based on the fact that in some situations, the researcher wishes to enhance the accuracy of the conclusions, reconfirm the findings and to have a complete picture of a certain situation (Kumar, 2014).

However, the mixed approach has also been a matter of controversy. Several criticisms of implementing a mixed method approach are listed by Teddlie and Tashakkori (2011) as follows:

- there is thesis incompatibility due to the differences between the paradigms of the quantitative and qualitative methods;
- there is subordination of the qualitative methods to a secondary position to quantitative methods;
- the cost of using a mixed approach tends to be much higher than the others;
- it is time consuming, affecting the timeline of most of the studies; and
- there are concerns about the quality of the writing of articles and chapters in the field.

While this strategy is less well known than either the quantitative or qualitative, Teddlie and Tashakkori (2011) believe that mixed strategies will keep developing and growing more popular over time and will be gradually accepted as a primary research approach. Although the current freedom of implementation for a mixed approach has led to the development of a considerable number of strategies, three primary models are found in the literature to be the most common approaches (Creswell, 2014) and these are discussed in the following subsections.

5.2.4.1 Convergent parallel mixed methods

This is a form of mixed methods design in which the researcher merges the use of quantitative and qualitative data with equal priority to provide a comprehensive analysis of the research problem. The researcher collects both types of data simultaneously, analyses them separately, and then the results are compared to evaluate the similarities or discrepancies (Creswell, 2014). The latter is considered the main challenge of implementing a convergent design as it can be difficult to compare results using data of different forms. Furthermore, Halcomb and Hickman (2015) accuse this strategy of being resource demanding. On the other hand, they highlight the reduction of the duration of the data collection period as one of the advantages to take into consideration in choosing this design.

5.2.4.2 Explanatory sequential mixed methods

The explanatory sequential design entails a collection of data divided into two stages. The researcher first conducts a quantitative research, analyses the results and then uses the findings to design a qualitative strategy (Creswell, 2014). The main purpose of this approach is to use qualitative skills to help explain in more detail the initial quantitative findings. A typical design involves using surveys as a first stage followed by qualitative interviews. This kind of approach appeals to researchers with a strong quantitative orientation, but challenges arise from identifying and presenting the results.

5.2.4.3 Exploratory sequential mixed methods

Unlike the explanatory sequential method, in the exploratory sequential mixed method the researcher begins exploring qualitative data and analysis to be then followed by a quantitative strategy (e.g. survey questionnaires). The intent of this method is to find out whether data from few individuals can be generalised to a large sample of a population. In this case, the sample in the qualitative phase should not be included in the quantitative phase to avoid duplication of responses; which means the two databases should not be compared. A summary of the three different approaches is presented in Table 5-1.

Table 5-1. Summary of differences between the choice of methodologies.

	Qualitative Approach	Quantitative Approach	Mixed Approach
Philosophical orientation	Inductive; Interpretivism	Deductive; positivism	Pragmatic
Approach to enquiry	Flexible methodology	Structured methodology	Structured, unstructured or both
Sample size	Large sample	Small groups	Can be both or either
Methods	Observation of behaviour or open-ended interviewing	Surveys or experiments	A mixture of qualitative and quantitative methods.

5.3 The Study Research Design

The research design is the conceptual structure within which a study is conducted (Kumar, 2005). Following the steps to build the appropriate research structure, the researcher first needed to identify the philosophical orientation about the world and nature of the study based on the research phenomenon under consideration (Creswell, 2014). This was then followed by the design of the research strategy which addressed the data collection method, data processing and data analysis strategy.

5.3.1 A pragmatic orientation

From the research problem and the set objectives, it can be assumed that a positivist worldview would be the most suitable approach to be adopted. However, considering that the ideals and points of view of construction practitioners might provide additional insights on addressing the aim of this study, the research has opted to not viewing the management of health and safety and the influence of the corporate manslaughter legislation on SMEs as a "single reality". The study has been designed to go further by believing that the mind of these individuals might reflect more than a single truth. As noted by Creswell (2014), the freedom of choice of methods is listed as pragmatism, where the researcher is more focused on understanding the problem (Rossman and Wilson, 1985) and uses pluralistic approaches to derive a more accurate answer to the problem. The research considers that the impact of health and safety in SMEs is a contemporary issue that needs to be addressed fully.

Despite pragmatism being the adopted worldview, the main objective of this study has a descriptive positivist perspective based on observation as it attempts to describe systematically the condition of the construction industry from a health and safety point of view. At the same time, the study attempts to deduct the influence of the legal system, specifically the corporate manslaughter legislation, on the development and performance of organisations. However, the study considered that assuming a constructivist approach would enhance the findings and conclusions of the research.

To meet the aim and objectives, an explanatory sequential mixed method design is adopted. The design is based on a sequential model in where first, a quantitative research is conducted, the results are then analysed for later conduct of a qualitative strategy. The intention of using a mixed method is to assist the explanation, interpretation and findings of the quantitative analysis by using the advantages of a qualitative approach. This type of research is commonly used in fields with a strong quantitative orientation but with challenges on identifying the results. An outline of the explanatory mixed method approach as applied in this study is shown in Figure 5-2.

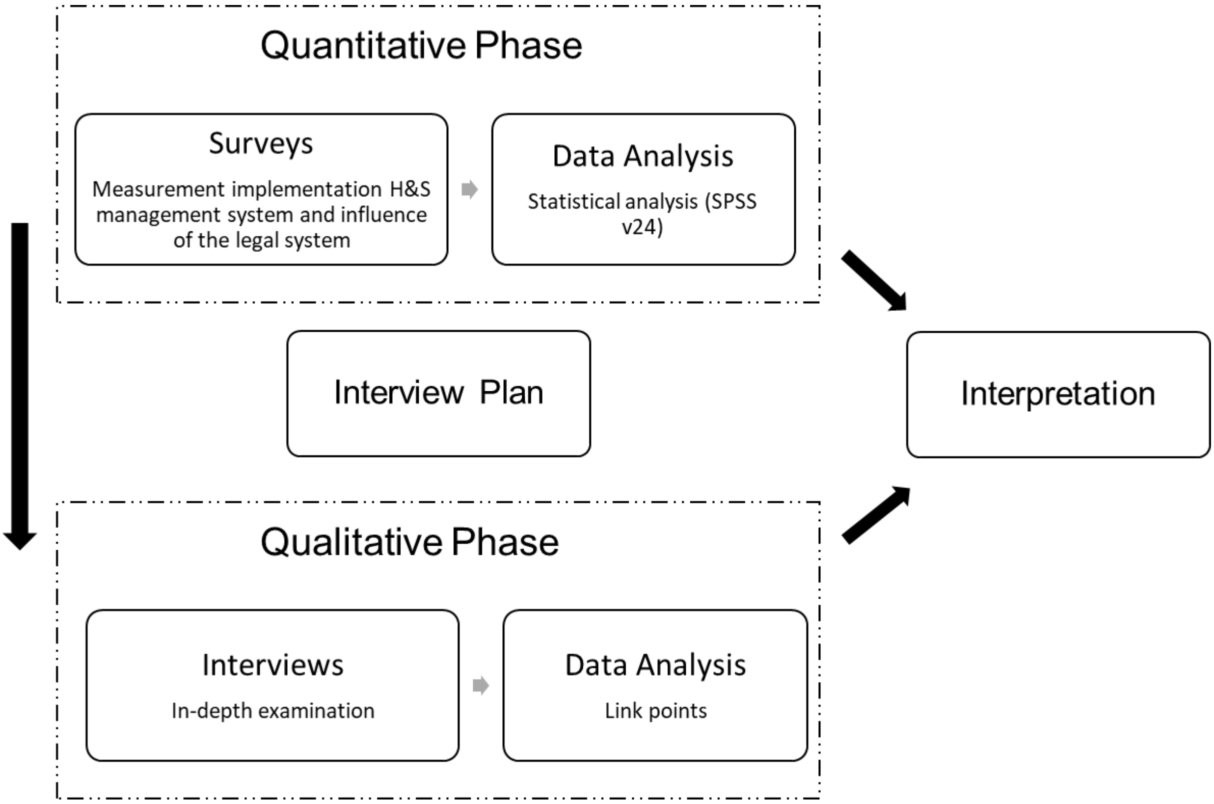

Figure 5-2. Research Plan

The application of a mixed methods approach in construction management studies is not uncommon. Similar approaches were adopted in construction management doctoral studies (cf. Ankrah, 2007; Tuuli, 2009; Manu, 2012). Specifically referring to health and safety commitment of SMEs, Arewa (2014) carried out a similar approach by implementing a quantitative strategy and subsequently conducting interviews as a supplementary approach to have an in-depth examination of the research problem.

The research background and justification (which has been addressed by Section 1.2) highlighted the gaps in knowledge regarding the management of health and safety in SMEs and the potential implications of the legal system. To fill these gaps, the following research questions were posed: i) Do SMEs implement a H&S management system? ii) Are SMEs aware of their basic legal duties to their employees? and iii) Does the CMCHA influence the way SMEs manage H&S? In order to obtain answers to the posed research questions, the quantitative and qualitative inquiries given by the overall research plan are explained below.

5.3.2 Quantitative approach to study

As previously mentioned, experimentation and surveys are the two common research strategies used in quantitative research. Considering that a laboratory setting (i.e. experiment) would not be ideal in achieving the aim of this research, a survey research design was adopted in the quantitative phase of this study. Specifically, a questionnaire was designed as the instrument to produce information about SMEs in respect of health and safety management and the influence of the law in their H&S management systems. The use of a questionnaire as an instrument to collect data has been used in many construction H&S studies (cf. Langford, Rowlinson and Sawacha, 2000; Kheni, 2008; Manu, 2012). Particularly, Arewa (2014) also used questionnaires to measure the health and safety best practice in SMEs. The aforementioned studies demonstrate the suitability of adopting a survey as an appropriate strategy for this research. Having determined the use of a survey, the quantitative phase was executed following five key stages: development of the instrument, a pilot study, main sampling, distributing the survey instrument; and analysis of the resulting data. These stages are addressed in the following sections.

5.3.2.1 Units of analysis

The aim of the quantitative phase was to measure the level of implementation of a H&S management system in construction SMEs and the influence of the CMCHA in the way H&S is being managed. From this it can be seen that the unit of analysis for the quantitative approach is the management of H&S, with the survey enquiring into its level of implementation in the construction sector and the influence of the legal system (i.e. CMCHA).

5.3.2.2 Questionnaire Development

As the instrument for the survey adopted on this research, a cross-sectional structured questionnaire was designed to assess the level of implementation of an occupational H&S management system in construction SMEs and the influence of the latest Corporate Manslaughter and Corporate Homicide Act into their safety system. As self-administered questionnaires do not allow for responses to any enquiries of the respondents, it needs to be developed in an interactive and easy to read style (Kumar, 2014). Being the main data collection tool, the questionnaire was designed to be 'respondent-friendly' in order to maximise the response rate, which is widely recognised as being particularly low in construction management research (Xiao, 2002).

As indicated earlier, the unit of analysis was the management of H&S and in order to obtain the data required to address the research aim, the views of all sorts of UK construction organisations were required. Considering that H&S is a controversial topic, it was expected that the participants would not give a truthful answer if the questionnaire was to evaluate their own company. Thus, the study refers to their perception of SMEs as a whole and takes the assumption that when participants are scoring the industry; they are actually scoring their own company. Arewa (2014) argued that the prominent judgment that individuals make about the construction industry must be based on their own experiences in their private companies.

The questionnaire survey was designed to measure four key variables linked to the aim and objectives of this research:

- VAR1: The level of implementation of an occupational H&S management system in construction SMEs;
- VAR2: The level of awareness of employers' H&S duties of care to their employees and persons other than employees;
- VAR3: The influence of factors related to H&S prosecutions and convictions in the management of H&S and further factors; and
- VAR4: The degree of improvement of H&S management factors since the enactment of the CMCHA.

The questionnaire was structured into seven sections. Section A requested general demographic information about the respondent and the organisation. The role of the participant within the organisation, years of professional experience managing H&S in construction, number of employees and turnover of the organisation are identified as important indicators that determine the reliability of the responses.

Section B was developed with the intention of measuring the level of implementation of a H&S management system based on a PDCA cycle. It is mainly focused on a senior management level, considering this is the level of hierarchy where the organisations' decisions take place. Due to the difficulty in collecting reliable data in health and safety research, examples of health and safety best practice were extracted from an extensive review of the literature (as shown in Section 3.5.2, Table 3-2 and Table 3-3) and were used as the questions in this section. The level of implementation of a H&S management system was measured using a 5-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Neither agree or disagree, 4 = Agree, 5 = Strongly agree). This scale is similar to that used by Arewa (2014) in measuring the H&S commitment of construction organisations in the UK. This section also incorporated an open-ended question to give the participant an opportunity to make any comments regarding the way H&S is managed in SMEs.

Sections C and D asked the respondents to judge whether SMEs are carrying out their duties to ensure safety of employees. This section was based on the duties of care of employers to their employees and persons other than employees dictated by the health and safety law. Due to the controversy of health and safety, this section assumes that the term "carry out" used on the stem of Section C of the questionnaire is also measuring awareness. The term "awareness" is therefore used in the analysis of this section. As with the section B, the awareness of the duties of care was assessed using a 5-point Likert scale (1 = Strongly disagree, 2 = Disagree, 3 = Neither agree or disagree, 4 = Agree, 5 = Strongly agree).

Section E requested the respondents to rate the influence of a series of factors related to H&S prosecutions, convictions and other factors on the way SMEs manage health and safety. These factors were identified from a review of the potential punishment from a H&S breach (as discussed in Chapter 4) and further factors identified through the literature. The degree of influence was assessed using a 5-point scale (0 = No influence, 1 = Minor influence, 2 = Some influence, 3 = Moderate influence, 4 = Vast influence).

Section F of the questionnaire requested the respondents' opinion regarding the influence of the CMCHA in the management of H&S in construction SMEs. The questions listed factors associated with the examples of H&S best practice previously given in section B of the survey instrument. The participants were asked to rate the improvement of the factors using a similar 5-point scale (0 = Not improved, 1 = Slightly improved, 2 = Somewhat improved, 3 = Moderately improved, 4 = Vastly improved). As with the section B, an open-ended question allowed the participants to comment on the effect of the CMCHA in SMEs.

Section G requested general information regarding further participation in the research. Respondents who provided their contact details were subsequently contacted to participate in the qualitative phase of the research.

In developing the questionnaire, most of the questions were close-ended questions with ordinal scales to make the questionnaire as easy to complete as possible. The design considered a total of seven sections with different scale measurements to avoid monotony and make the questionnaire more interesting for respondents. Moreover, following the recommendation by Farrell (2011), the direction of eight questions randomly selected from Sections B and C was reversed to counteract the effect of 'yea-sayers' and 'nay-sayers'.

The various sections of the questionnaires encompassed 79 questions and were put together in 7 pages and provided instructions at the beginning of each section. A cover and information paged was annexed to the survey instrument describing the aim of the research, the various sections in the questionnaire, approximate time to complete (i.e. 15 minutes), and the contact information of the researcher (see Appendix C). Emphasis was made on the confidentiality of the data, so the answers could be given as honestly as possible. Once the questionnaire was developed, it was ready for testing.

5.3.2.3 Pilot Survey

For this research, a pilot study was necessary to demonstrate the methodological precision of the designed survey instrument (Munn and Drever, 1990). The pilot survey was conducted to evaluate some specific aspects regarding the design and suitability of the data collection process. Among the elements evaluated were cost, response rate, sampling technique, consistency of responses and the feasibility of the survey.

The pilot study targeted UK micro, small and medium organisations in the Midlands region (Birmingham, Coventry, Dudley, Solihull, Walsall, Wolverhampton, Stoke-on-Trent, Derby, Leicester and Nottingham) offering construction services. It was conducted on a sample of 50 organisations randomly drawn at no cost from UK Manta online database. Google search engine (www.google.com) was used to double-check the organisation's contact information. Also, the register of the Company House (beta.companieshouse.gov.uk) was used to reveal whether the organisations were currently active in business. Those companies which had ceased trading were randomly replaced. A questionnaire was sent by post requesting for the participation of the Director or other senior manager with direct involvement in health and safety and to be returned in the pre-paid envelope provided (see Appendix A). A link to an online questionnaire hosted at Survs.com was also provided in case the participant would prefer to fill out the questionnaire by electronic means. The pilot survey commenced on the 16th of August 2017 when the questionnaires were distributed and closed after 6 weeks on the 27th of September 2017. During the period, two electronic reminders were sent to the organisations which had a public email address.

5.3.2.4 Results of Pilot Study, Issues and Remedial Actions

The survey generated a total of 10 (i.e. 8 via post and 2 via internet) responses yielding a response rate of 20%. This is not very different when compared to the 20% and 22% response rate achieved in the pilot study reported in (Ankrah, 2007; Manu, 2012) respectively. The roles of the responders were: Company director or owner (50%), health and safety manager (30%) and the other 20% stated a different role from the suggested (i.e. company secretary, accounts manager). 90% of the respondents had more than 10 years managing H&S, and 10% have from 5 to 10 years. Regarding the number of employees in the organisation, only one participant indicated to have 250 or more, and two companies registered a turnover over than £36m. The participants represented different types of construction organisations, among these: general contractors, construction management, design and build and specialist contractors. Half of the participants identified residential building as their main area of work, while the others focus on non-residential, repair and maintenance and civil engineering works. Also, it is important to highlight that 9 out of the 10 organisations have more than 15 years operating in the construction industry. From the demographic data, the type of organisation, the role of the respondents in the organisations and the years of experience managing H&S is an indication that the questionnaires reached the targeted participants.

Although the participants did not suggest any modifications to the questions, an analysis of the pilot survey identified that one of the sections did not capture the necessary information required to achieve the aim of the study. A total of 11 questions were introduced to this section.

Moreover, the double-checking strategy previously described showed that a total of 20 organisations were dissolved or had moved away which indicated that the information of the Manta database could be outdated. A different online directory, UK Kompass, was then designated for the main survey. The fact that some of the responses were obtained from the online platform gives an indication that both approaches should be considered for the main survey (i.e. postal and electronic). Having completed the revision of the survey design, the questionnaire was suitable to be administered in the main survey.

5.3.2.5 Sampling for Main Survey

A sample is defined by Sapsford and Jupp (2006) as a set of elements selected from a population using a selection model. The samples are made in order to save time and effort but also to obtain a consistent estimate of the population status in terms of research (Babbie, 1990). Although a sample is selected, the interest of a survey questionnaire is to make a generalisation of the entire population from which the sample has been drawn, and is therefore, the intention of this research. The first step in sampling is to define the population of interest (Schofield, 2006). As previously mentioned, the target population for this research is SMEs offering construction services in the UK. In Chapter 2, it was reported that there were 295,800 construction SMEs registered in the UK (ONS, 2016). As it is impractical to collect data from all construction SMEs, the application of a sampling technique was necessary.

Following the examples of (Xiao, 2002; Ankrah, 2007; Manu, 2012), the sampling frame that was adopted for the selection of the sample was the list of construction SMEs registered in the UK Kompass register as of 2017. In order to determine a suitable size for the sample, the following formula from Blair, Czaja and Blair (2013) and implemented by Ankrah (2007) Manu (2012) was applied:

$$ss = \frac{z^2 \; x \; p \; (1 - p)}{c^2}$$

Where:

ss = sample size

z = standardised variable

p = percentage picking a choice, expressed as a decimal

c = confidence interval, expressed as a decimal

As with most other research, a confidence level of 95% was assumed (Munn and Drever, 1990; Ankrah, 2007; Manu, 2012). For a 95% confidence level (i.e. significance level of α = 0.05), z = 1.96. Based on the need to find a balance between the level of precision, resources available and usefulness of the findings (Maisel and Persell, 1996), a confidence interval (c) of ±10% was also assumed for this research. When determining the sample size for a given level of accuracy, the worst-case percentage picking choice (p) should be assumed (Blair, Czaja and Blair, 2013). This is given as 50% or 0.5. Based on these assumptions, the sample size was computed as follows:

$$ss = \frac{1.96^2 \; x \; 0.5(1 - 0.5)}{0.1^2}$$

ss = 96.04

Therefore, the required sample size for the survey is 96 construction SMEs. However, this figure requires a further correction for finite populations. The formula for the correction is given in (Blair, Czaja and Blair, 2013) as:

$$corr\ ss = \frac{ss}{1 + \frac{ss - 1}{pop}}$$

Where:

pop = target population

The corrected sample size is therefore:

$$corr\ ss = \frac{96.04}{1 + \frac{96.04 - 1}{295{,}800}}$$

corr ss = 96.01

The sample size still remains approximately 96 construction SMEs. The UK construction industry is known for poor response to questionnaire surveys. 20-30% is believed to be the standard (Takim, Akintoye and Kelly, 2004). For this reason, it was necessary to adjust the sample size to account for non-response as done by Manu (2012). Based on the results of the pilot study, the main survey assumed a response rate of 20%. The appropriate sample size to be surveyed was calculated as follows:

$$survey\ ss = \frac{corr\ ss}{response\ rate}$$

$$survey\ ss = \frac{96.01}{0.20} = 480\ organisations$$

In an effort to further improve the number of responses, the sample size was doubled to 960 construction SMEs and approximated to 1,000 organisations. A random selection of construction SMEs from the UK Kompass directory (2017) was thus made to provide a list of 1,000 potential participants by generating random numbers using Microsoft Excel 2016.

Applying the same strategy as the pilot survey, the contact information of each of the participants was double-checked using Google search engine (www.google.com). Also, the status of the organisation was checked using the online registry of the Company House (beta.companieshouse.gov.uk). The search again revealed that some of the organisations on the list were no longer trading. Once again, these were randomly replaced. It should be noted that although this was a laborious process, it was necessary in ensuring an adequate response, particularly given the difficulty in obtaining participation in H&S studies (Gibb et al., 2002). Despite the effort, some questionnaires were undelivered and returned to the researcher. In total, 29 questionnaires had to be resent to achieve the calculated sample size.

5.3.2.6 Quantitative Methods of Analysis

5.3.2.6.1 Descriptive Statistics

In order to develop a thorough understanding of the nature of the data, descriptive statistics was employed. Descriptive analysis forms the basis of quantitative analysis of data as it provides simple summaries about the sample and the measures. The analysis includes measures of frequency distribution such as frequency and percent; measures of central tendency such as the mean, median and mode; and measures of dispersion or variation such as the standard deviation. The descriptive statistics were undertaken using Microsoft Excel 2016 and SPSS v24. This stage of analysis was strictly necessary to demonstrate that the respondents were indeed representing the targeted population for the study and that their current roles within their organisations were suitable in according credence to their responses and hence the overall research findings. In this study, individual mean rating calculations are used to determine the level of implementation of a H&S management system within construction SMEs, measure the level of awareness of the employers of their duties of care to their employees, measure the extent to which factors related to H&S prosecutions and convictions and further factors influence the way H&S is being managed and to determine whether the enactment of the CMCHA has made improvement in construction H&S management. The use of overall and individual ratings via mean calculation has been applied in other construction H&S studies (Hide, 2003; Manu, 2012; Arewa, 2014). However, in order for such mean values to be interpreted with confidence, it is necessary to evidence agreement among the raters (Huang et al., 2007; Anvuur and Kumaraswamy, 2010). Hence, inter-rater agreement test was also carried out in this study.

5.3.2.6.2 Inter-rater Agreement Test

Inter-rater agreement represents the extent to which different raters tend to make exactly the same judgment about the rated subject (Tinsley and Weiss, 1975). Estimates of inter-rater agreement (IRA) are used to address whether scores given by judges are interchangeable or equivalent in terms of their absolute value. Inter-rater agreement could be confused with inter-rater reliability which represents the extent to which the relationship between two rated individuals is the same, although the absolute numbers used to express this relationship may differ from judge to judge

(Tinsley and Weiss, 1975). Inter-rater agreement test has been applied in construction management studies (Tuuli, 2009; Anvuur and Kumaraswamy, 2010) and specially focused on health and safety studies (Lingard, Cooke and Blismas, 2010; Manu, 2012). When multiple judges rate a single target on a single variable using an interval scale of measurement, inter-rater agreement (IRA) can be assessed using the rWG index (Lindell, Brandt and Whitney, 1999; LeBreton and Senter, 2008). James, Demaree and Wolf (1984) proposed single item inter-rater agreement (rWG) for within group agreement in single-item and multiple-item scale inter-rater agreement index (rWGj) for multiple-item situations.

Conventionally, rWG values ≥ 0.70 is considered evidence of strong agreement (LeBreton and Senter, 2008). However, debates about the interpretation of the inter-rater agreement indices by James, Demaree and Wolf (1984) suggest that far more stringent standards are needed (Harvey and Holl, 2004). Cohen, Doveh and Eick (2001) reported that rWG values vary considerably as a function of group size and number of response items and thus implying that the conventional value of 0.70 may not be reasonable for all configurations. This study followed this recommendation and the rWG values for significant agreement were estimated based on a sample size (i.e. group size) of 96 and a 5-point scale. The rWG indices were calculated using the R-Software Multi-level Package.

5.3.2.6.3 Demographic Analysis

Inferential statistics was also used in this study to evaluate differences in mean ranks and assess the null hypothesis that the medians are equal across certain groups (McDonald, 2009). Depending on the type of data, inferential statistics procedures are categorised in parametric and non-parametric. Parametric statistics applies when the variables are measured on a continuous scale and assumes that the data is normally distributed (Morgan, 2013). Alternatively, non-parametric statistics is a distribution-free category most likely to be used for variables at the nominal or ordinal level of measurement.

With the collection of nominal and ordinal data, this study considered Kruskal-Wallis and Mann-Whitney U as the non-parametric tests to evaluate whether the demographic characteristics of the respondents (i.e. H&S experience, size, turnover, area of work and geographical location) affected the responses. Kruskal-Wallis tests were used to evaluate whether the population medians on a dependent variable are the same across all levels of a factor. To conduct the test, cases must have scores on an independent or grouping variable and on a dependent variable. The independent or grouping variable divides individuals into two or more groups, and the dependent variable assesses individuals on at least an ordinal scale. However, when a factor has more than two levels and the overall test is significant, follow-up tests must be conducted to examine the comparison between pairs of group medians. Hence, Mann-Whitney U tests were used to conduct pairwise comparisons. The p-value of these tests are fairly accurate if the number of cases is greater than or equal to 30.

5.3.2.6.4 Correlation

Correlation was also used as part of the analysis on this study. It was used to assess the strength and direction of relationships between the measured variables. In this case, as there is an interest in evaluating a linear relationship between the variables, the Pearson's correlation coefficient was calculated. Pearson's equation to compute the correlation coefficient is given by Field (2017) as:

$$r = \frac{\sum_{i=1}^{n}(x_{i-\overline{x}}) (y_{i-\overline{y}})}{(n-1)S_x S_y}$$

Where:

x and y are any pair of variables whose level of correlations is being sought

$\overline{x}$ and $\overline{y}$ are the means of x and y respectively

s_x and s_y are the standard deviations of x and y respectively

n is the sample size.

The correlation coefficient lies between -1 and +1. Field (2017) explains that a coefficient of +1 indicates that the two variables are perfectly positively correlated, so as one variable increases, the other increases by a proportionate amount. Conversely, a coefficient of -1 indicates a perfect negative relationship: if one variable increases, the other decreases by a proportionate amount. A rule of thumb (as shown in

Table 5-2) has been introduced for interpreting the size of a correlation coefficient (Hinkle, Jurs and Wiersma, 2009).

Table 5-2. Interpretation of correlation coefficients. Source: Hinkle, Jurs and Wiersma (2009)

Size of Correlation	Interpretation
0.90 to 1.00 (-0.90 to -1.00)	Very high correlation
0.70 to 0.90 (-0.70 to -0.90)	High correlation
0.50 to 0.70 (-0.50 to -0.70)	Moderate correlation
0.30 to 0.50 (-0.30 to -0.50)	Low correlation
0.00 to 0.30 (-0.00 to -0.30)	Negligible correlation

Considerable caution must be taken as the correlation coefficients give no indication of the direction of causality. Field (2017) points the existence of 'the third-variable problem' or 'tertium quid' which refers to the possibility of having other measured or unmeasured variables affecting the results. Moreover, correlation coefficients say nothing about which variable causes the other to change. The correlation analysis was conducted using SPSS version 24.

5.3.2.6.5 Regression

The final statistical test used to examine the variables of this research was regression analysis. In regression analysis, a predictive model is developed from the data and is then used to predict values of the dependent variable from one or more independent variables (Field, 2017). When the model involves a single independent variable, the statistical technique is called simple regression. And when it involves two or more independent variables, it is termed multiple regression. A generic equation of a simple regression model is given as:

$$Y = b_0 + b_1V_1$$

Where:

Y is the outcome variable

b_0 is the intercept

b_1 is the regression coefficient

V_1 is the independent variable

According to Hair (2010), the coefficient of determination (R^2) is the commonly used measure of predictive accuracy for a regression model. It represents the combined effects of the entire variate in predicting the dependent variable and it is calculated as the squared correlation between the actual and predicted values of the dependent variable. It ranges from 1 (perfect prediction) to 0 (no prediction).

There are key assumptions associated with the regression analysis which must be met to guarantee a model in which the actual errors in prediction are as a result of the real absence of a relationship among the variables and not caused by some characteristics of the data not accommodated by the regression procedure (Hair, 2010): Linearity or homoscedasticity, normality of the error term distribution, autocorrelation and no multicollinearity.

The linearity of the relationship between independent and dependent variables represents the degree to which the change in the dependent variable is associated with the independent variable (Hair, 2010). Linearity of any bivariate relationship is examined through residual plots. Where non-linear relationships exist, alternative regression methods such as the introduction of polynomial terms must be considered.

Normality of the predictor and outcome variable is a fundamental assumption of multiple regression and perhaps the most frequently violated according to Hair (2010). The simplest diagnostic for the set of predictors in the equations is a histogram of residual, which by visual inspection should be bell-shaped. A better method is the use of normal probability plots which compare the standardised residuals with a normal distribution which is represented by a straight diagonal line. If a distribution is normal, the residual line closely follows the diagonal.

Also, linear regression analysis requires that there is little or no autocorrelation in the data (Field, 2017). This assumption can be tested with the Durbin-Watson test, which tests the null hypothesis that the residuals are not linearly autocorrelated. The test can vary between 0 and 4 with a value of 2 meaning that the residuals are uncorrelated. As a very conservative rule of thumb, values between 1 and 3 are of better use (Field, 2017).

Lastly, there should be no perfect linear relationship or multicollinearity between two or more of the predictors (Field, 2017). This assumption applies to multiple regression analysis. A Variance Inflation Factor (VIF) > 10 is an indication that multicollinearity may be present.

5.3.3 Qualitative approach

One significant aspect of the research strategy adopted in this study was to conduct a qualitative inquiry to have an in-depth examination of the research problem. The adoption of this approach constitutes the second phase of the explanatory sequential mixed strategy designed for this research. The advantage of qualitative research lies in the interpretation of the data and bringing the values and beliefs of others into the study (Creswell, 2014). It was believed that the flexible and open characteristic of a constructivist approach would help the researcher to obtain first-hand information of how experienced construction practitioners view the management of health and safety in SMEs and the impact of the introduction of CMCHA in the legal system.

Qualitative research has been strongly advocated for construction management research by Seymour and Rooke (1995). Moreover, it has been a common practice in health and safety studies. For instance, Bust, Gibb and Pink (2008) examined how construction workers interpret and use audio-visual texts on site. Furthermore, Lingard and Holmes (2001) conducted a qualitative study to understand health and safety risk control in small construction businesses. Roelofs et al. (2011) also used a qualitative approach to understand how language barriers and cultural differences impact on safety performance of construction worksites.

5.3.3.1 Instrumentation

To obtain the data for this approach, telephone interviews were chosen among the different data collection methods since they allow people to share their insights regarding specific issues (Alshenqeeti, 2014). Interviews have been widely chosen as the data collection instrument in construction health and safety management research. For instance, Hide (2003) used focused group interviews involving construction professionals as part of her inquiry into causal factors in construction accidents. Whittington, Livingston and Lucas (1992) used interviews with project managers to investigate the link between management and organisational factors and accidents. As a second phase of his study, Arewa, (2014) also used interviews to assess the health and safety best practice in construction SMEs.

Interviews vary in nature and can be classified according to their structure and level of formality in structured interviews, semi-structured interviews and unstructured interviews. The main characteristics of the different types of interviews are summarised in Table 5.3.

This research opted to conduct semi-structured interviews as it allows free flow of information from the interviewees and, therefore, provides an in-depth understanding of the research problem. Also, this type of interview allows the researcher to contribute with relevant insights as they emerge in the course of the interview (Myers, 2013).

Table 5-3. Main characteristics of types of interview

Type of interview	Main characteristics
Structured	• Closed questions; • pre-coded; • data collected through formal style of questioning; • same questions and wording for all participants.
Semi-structured	• Some questions agreed on; • answers developed according to individual; • data collected through both formal and informal styles of questioning; • respondents provide topical answers and are allowed to add extra information.
Unstructured	• Conversational • data is collected through informal style of questioning; • respondents say as much as they wish; • answers are provided by respondent in any order.

Source: Patton (2002); Creswell; (2014); Bryman (2016)

Guided by confidentiality principles, the supervisory team and the university policies, the choice of interview went through ethical approval to protect the participants of the study.

Methods to record the participants are fundamental in interviews (Patton, 2002). A laptop and digital voice recorder were used to carefully create the interview audio files and store them prior to transcription. In order to ensure that the interviews were successfully recorded, the instruments were tested prior establishing the connection with the participant. After recording the interviews, the recording files were saved on a password protected hard disk drive and uploaded to a cloud to avoid losing any data.

5.3.3.2 Interview Development

The interview was designed to probe and ask the participants for more details about the problem in question. The questions addressed the areas which the researcher considered necessary to emphasise on in order to achieve the objectives of the study. These included validation of significant findings of quantitative analysis and additional comments on the research problem. As required with semi-structured interviews, an interview schedule (as shown in Appendix I) was developed to guide the interview process. The 15 questions were divided into 3 sections according to the main area addressed. The first section aimed to disclose a profile of the interviewee, asking about their current position, type of organisation and experience managing H&S. This was to ensure the participant was suitable and competent to provide reliable data. The second section included questions addressing the management of H&S in construction SMEs. As in the quantitative approach, the researcher attempted not to ask direct questions as to how their organisations are managing health and safety. This is due to H&S being a controversial topic in construction management. Rather, the questions were posed as SMEs in general with the intention of helping the researcher to make generalisations of the findings. For instance, it was asked if the H&S performance of SMEs depends on the type or organisation. The third section was regarding the legal aspects of H&S management. These questions included some findings of the quantitative analysis which were unexpected or not aligned with the literature. As an advantage of a semi-structured interview, participants were also given the opportunity to give their free views on the effect of the enactment of the CMCHA in the construction industry.

5.3.3.3 Selection of Participants

The purpose of using a qualitative study phase in an explanatory mixed method is to improve the understanding of the quantitative results to a level that would fulfil the objectives of the study. There are no established guidelines as to how researchers should proceed with selecting the cases for the follow-up qualitative analysis as the intent is to select participants that can best provide this understanding. According to Graff in Hall and Roussel (2014), using probability sampling for the QUAN phase and purposive sampling for the QUAL phase is a common practice when implementing a mixed method approach. Creswell and Plano Clark (2011) added that the same individuals should be included in the two stages of an explanatory research design. Furthermore, they added that drawing the participants for the qualitative and quantitative inquiries from the same population increases validity in the study. However, the qualitative data collection will be from a much smaller sample than the quantitative data collection considering that the intention is provide additional details and not to merge or compare data.

Therefore, it would be reasonable to implement purposive sampling for the qualitative phase of the study. In purposive sampling, researchers rely on their own judgment when choosing members to participate in the study. In this case, the participants who completed the survey questionnaire and expressed interested in participating in the interview phase were targeted as potential participants for the interviews.

5.3.3.4 Analysis of interviews

The analysis of qualitative data is non-standardised and therefore is a challenging process that requires creativity and systematic searching (Baiden, 2006). The collected data needs to be explored, analysed, synthesised and transformed in order to meet the research objectives of the study. Despite the different analysis strategies in qualitative research, Creswell's (2014) suggests that the ideal situation is to blend the general steps with the specific research strategy steps. Therefore, this study followed the six main steps of Creswell's (2014) guide for the qualitative data analysis process (as shown in Figure 5-3).

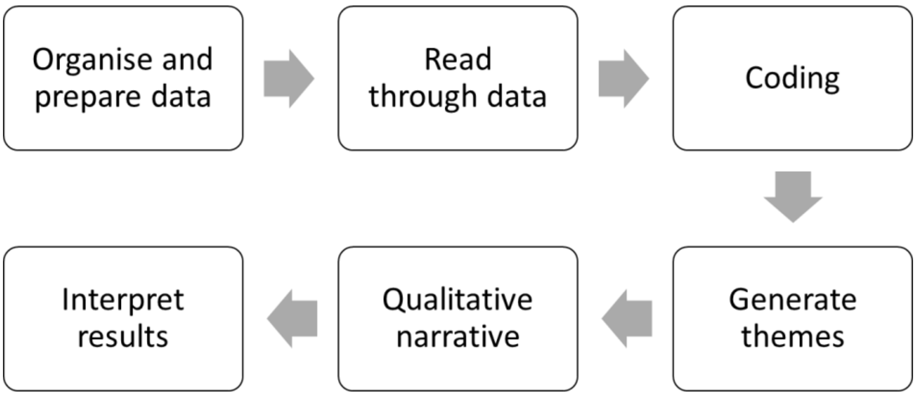

Figure 5-3. Data analysis in Qualitative Research. (Adapted from Creswell, 2014)

The first step was to organise and prepare the data for analysis. This involved transcribing the audio interviews by using computer software and manual means, optically scanning material and arranging the data into different types depending on the sources of information. This was then followed by reading through all the data to obtain a general sense of the information and reflect on the overall meaning.

The third step required to do the coding of the transcripts. Coding transcripts can be by manual means or by computer software. Computer software is very useful for large volumes of data, and manual coding can be considered when the volume of data is manageable (Seale, 2000; Spencer, Ritchie and O'Connor, 2003). In this case, the coding was carried out manually by colour coding as recommended by Creswell (2014) as the volume of data was considered manageable. This process involved searching the text for similar themes and keywords and then marking them with a code colour which would then be analysed to identify any patterns. As the fourth step, the coding process was used to generate a description of the setting as well as categories for analysis. These themes should display multiple perspectives from individuals and be supported by diverse quotations and specific evidence since they will represent the major findings of the analysis.

The fifth step for the analysis of quantitative data consisted in choosing how the themes will be represented in the qualitative narrative. The approach adopted for this study was detailed discussion of the different themes addressing the multiple perspectives of the participants and quotations. The final step of the analysis involved making an interpretation of the results and findings. This could be the researcher's personal interpretation, or a meaning derived from a comparison of the findings with information collected from the literature or theories (Creswell, 2014).

5.3.3.5 Reliability and Validity of qualitative findings

In order to establish confidence in the findings and conclusions in qualitative research, it is important to demonstrate two related but different terms: validity and reliability. Validity is one of the strengths of qualitative research and means that the researcher checks for the accuracy of the findings by employing certain procedures, and qualitative reliability indicates that the approach taken by the researcher is consistent across different researchers and projects (Gibbs, 2017).

For this phase of the study, validity was ensured by applying multiple approaches as suggested by Butterfield *et al.* (2005) and Creswell (2014). The analysis was carried out working directly with the verbatim transcripts. Also, sample quotes in the participants' own words were provided to demonstrate grounding of the findings. Themes were developed based on converging several perspectives from the participants. A further consideration was to refer to the literature for support of the findings as a means of demonstrating theoretical agreement. Member checking was also carried out by asking the participants to comment of the findings of the quantitative and qualitative analysis. Lastly, research supervisors reviewed and questioned the process of the qualitative inquiry.

Reliability was ensured by following suggestions by Gibbs (2017). One of the considerations was to re-read and check the transcripts to make sure that they do not contain transcription errors. The researcher also made sure that there was not a drift in the definition of codes, a shift in the meaning of the codes during the process of coding. This was accomplished by constantly comparing data with the codes.

5.4 Summary

This chapter presented and justified the research design adopted to achieve the objectives of this study. Adopting a pragmatic paradigm, a sequential explanatory mixed method research design was employed which involved both quantitative and qualitative methodologies. A survey questionnaire was designed for the quantitative inquiry to measure the level of implementation of a H&S management system in construction SMEs and the influence of the UK legal system (i.e. CMCHA) in the way they manage H&S. The data was analysed and then used to design the follow up interview stage. The qualitative approach employed semi-structured interviews with experienced construction professionals who aided to conduct an in-depth examination of the problems in question. The analysis and subsequent findings of the quantitative and qualitative inquiries are presented in the following chapters along with their limitations and assumptions.

Chapter 6: Quantitative Data Analysis: Results and Findings

6.1 Introduction

The previous chapter described that a sequential explanatory mixed method strategy was adopted for this research. The adopted strategy comprises an initial quantitative phase which is then followed by a qualitative inquiry. This chapter addresses the third and fourth objective of this research in terms of presenting the data collection results and analysis of the quantitative inquiry. The quantitative phase was designed to measure the level of implementation of a H&S management system in construction SMEs. Moreover, it was also intended to determine the level of awareness of the health and safety duties of care owed by employers to their employees and how the UK legal system influences the way SMEs manage health and safety. The following sections, first, present the process of the data collection, highlighting the characteristic of the participants to demonstrate their suitability for participation in this research. Then, the findings of the analysis are also presented and discussed in relation to assessing how SMEs are currently managing H&S.

6.2 Response Rate

The main collection of data took place from November 2017 to March 2018. A total of 1000 questionnaire packs were mailed out to the sample of construction SMEs. Each of the pack contained: a signed cover letter with a brief description of the research (see Appendix C); the survey questionnaire (see Appendix D); and a self-addressed reply envelope. Once again, a link to an online questionnaire hosted at Survs.com was also provided in case the participant would prefer to fill out the questionnaire by electronic means.

Creswell (2014) recommends follow-up mails or reminders to ensure a good response rate. Resource limitations meant that only electronic reminders could be undertaken. During the duration of the survey, three reminders were sent by electronic mail to the participants encouraging their participation in the research. The e-mails also contained the link to the online version of the questionnaire hosted at Survs.com.

At the time of closing the survey, a total of 98 questionnaires had been returned out of the 1000 administered. Considering the postal and electronic responses, an overall response rate of 9.8% was achieved. As reported by Manu (2012), a breakdown of the response rate based on the mode of response (Table 6-1) suggests that postal questionnaires are better than electronic questionnaires in terms of response rate.

Table 6-1. Tabulation of the study questionnaire response rate.

Mode of questionnaire response	Number responses received	Response rate
Electronic	24	24%
Postal	74	76%
Total	**98**	**9.8%**

Takim, Akintoye and Kelly (2004) reported that the response rate norm for questionnaire survey is between 20% and 30%. Other sources that support this view include Black, Akintoye and Fitzgerald (2000) which reported a response rate of 26.7% for a questionnaire survey. However, lower responses have been recorded in other UK-based construction management surveys (e.g. 8.82% reported by Sutrisna, 2004; 13.48% obtained by Ankrah, 2007 and 18.7% reported by Manu, 2012). Although the response rate of 9.8% yielded in this survey is significantly lower compared with the response rate in these other sources, this should be weighed against the length of the questionnaire which contained 7 pages and, as suggested by Manu (2012), against the difficulty in obtaining participation in H&S studies in UK. In terms of the actual number of responses, it should be noted that the 98 responses are slightly above the calculated sample size (i.e. 96) for this study. Moreover, authors in the literature have accepted as a rule of thumb that any sample with size greater than 30 (n>30) is considered an adequate sample for undertaking inferential statistics (Munn and Drever, 1990; Sutrisna, 2004). Given these observations, the obtained response rate is considered adequate for the purpose of analysis.

The 98 responses computed an estimated margin of error 9.90% due to sampling at 95% confidence level (refer to Appendix B). This can be interpreted as meaning that there is a 95% probability that the results obtained from this survey lie within a ±9.90% range.

6.3 Data Editing

The responses from all 98 questionnaires were first input in Microsoft Excel 2010 to enable ease of data management and subsequent analysis using software packages. Kumar (2014) suggests that the first step of processing raw data is to scrutinise the questionnaires to identify and minimise errors, incompleteness, misclassification and gaps in the information obtained from the respondents. Data examination is essential before any analysis (Hair, 2010).

6.3.1 Missing data analysis

The responses received contained some missing data. Missing data commonly occurs in research (e.g. skipping questions, revealing sensitive information, or not applicable) and can be problematic in the analysis of the data. According to Hair (2010), analysis of missing data is required to improve the validity of studies. Therefore, in order to have a decent data set for the data analysis stage, the extent of the missing data was determined and remedial actions were evaluated.

The Missing Values Analysis tool of SPSS version 24 was used to analyse the patterns of missing data (Appendix F). Following the recommendation by Hair (2010), 2 cases were excluded from the sample due to an excessive missing data (i.e. more than 50% of questions were unanswered). The effective sample size was thus 96 responses. In terms of the measured variables, none of them resulted in more than 15% of missing data which is the threshold recommended by Hair (2010) for deletion. Further analysis was carried out following the exclusion of the 2 cases to determine the appropriate imputation method for the missing values. Little's Missing Completely at Random (MCAR) Test was not significant, confirming that the data is missing completely at random. Following the recommendations by Hair (2010), the Expectation-Maximisation (EM) was used to estimate and replace the missing values.

6.3.2 Internal reliability

The screening of the data also explored the use of Cronbach's alpha (α) to measure the internal reliability of the data obtained through the use of questionnaires. Alpha is typically used when you have Likert-type items that are summed to make a composite score (Barrett et al., 2012). The test determines the consistency of the responses given by the participants. The reliability tests were carried out using SPSS version 24 and, due to the use of different scales throughout the questionnaire, each section was analysed separately. Sections C and D were merged as they measure similar variables with the same scale. The results produced Cronbach's alpha (α) coefficients ranging from 0.90 to 0.98 as illustrated in Table 6-2.

Table 6-2. Reliability Statistic Test for Questionnaire.

Section of Questionnaire	Cronbach's Alpha (α)	Number of items
Section B	0.97	30
Section C & D	0.90	10
Section E	0.94	11
Section F	0.98	19

Based on the results obtained, the consistency and stability of the responses are good enough for the purpose of the research. According to the rule of thumb provided by George and Mallery (2016), coefficient alpha (α) ≥ 0.90 indicates an excellent consistency of the measured items. The data was now ready for descriptive and inferential analysis.

6.4 Characteristics of the Participants

6.4.1 Demographic information (QA1 – QA8)

The following tables present the demographic information of the respondents, the aim is to provide an overview of the expertise of the respondents and a brief profile of the organisations they represent. As can be seen from Table 6-3, most of the respondents (i.e. 58.3%) are company directors/owners while 30.2% are H&S managers within the organisations. The remaining 11.5% of the responses are spread between project managers and company's secretaries. The study considered the possibility of a diversity of roles among the participants, some of them not necessarily related to H&S. Therefore, it was reasonable to capture the respondents' years of experience managing H&S and ensure they are the kind of participants who were targeted for this survey. Table 6-4 indicates that the majority of the respondents (88.6%) have at least 5 years of experience managing H&S.

Table 6-3. Job title of the participants.

Job Title	Frequency	Percentage (%)
Project Manager	4	4.2
H&S Manager	29	30.2
Company Director	56	58.3
Other	7	7.3
Total	96	100

Table 6-4. Years of experience in H&S of the participants.

Years of Experience in H&S	Frequency	Percentage (%)
Less than 5	11	11.5
5-10	19	19.8
More than 10	66	68.8
Total	96	100

It was important for this study that the survey sample represented the construction micro, small and medium organisations (SME) in the UK. A breakdown of the number of employees and turnover of the respondents' organisations (shown by Table 6-5) shows that 95% of the participants can be defined as SMEs, while 5% are large. Also, the majority of the organisations (i.e. 77%) have been offering their services for more than 15 years (Table 6-6), meaning that they are capable of observing any transition in H&S management since the Corporate Manslaughter and Corporate Homicide Act (CMCHA) came into force in 2008. Regarding the type of work, 50% of the organisations are general contractors while 36% stated to be specialist contractors (

Table 6-7) and, as showed in Table 6-8, mainly focused in repair and maintenance (34%) and residential building (27%). In terms of location,

Table 6-9 shows that the UK organisations under analysis work mainly in England.

Table 6-5. Number of employees and Turnover of the survey organisations.

Number of Employees	Frequency	Percentage (%)	Annual Turnover	Frequency	Percentage (%)
Less than 10	22	22.9	632k or less	11	11.5
10-49	34	35.4	633k - 10.2m	53	55.2
50-249	36	37.5	10.3m – 36m	27	28.1
More than 250	4	4.2	More than 36m	5	5.2
Total	**96**	**100**	**Total**	**96**	**100**

Table 6-6. Years in operation of the survey organisations.

Years in Operation	Frequency	Percentage (%)
0-5 yrs	1	1
5-10 yrs	6	6.3
10-15 yrs	12	12.5
More than 15 yrs	77	80.2
Total	**96**	**100**

Table 6-7. Type of construction organisation of participants.

Type of Organisation	Frequency	Percentage (%)
General Contractor	50	52.1
Design and Build	7	7.3
Specialist Contractor	36	37.5
Construction Management	2	2.1
Other	1	1
Total	**96**	**100**

Table 6-8. Main area of work of the participants' organisations.

Main Area of Work	Frequency	Percentage (%)
Residential Building	27	28.1
Civil Engineering	8	8.3
Repair and Maintenance	34	35.4
Non-Residential Building	18	18.8
Other	9	9.4
Total	**96**	**100**

Table 6-9. Main region of work of the participants.

UK Region of Work	Frequency	Percentage (%)
England	81	84.4
Scotland	4	4.2
Wales	3	3.1
Northern Ireland	1	1
Other	7	7.3
Total	**96**	**100**

From the demographic information of the survey participants, it is evident that the expertise and current role of the participants is respectable and the types of the organisations they represent are suitable to respond adequately to the subject being addressed by the survey. Therefore, the responses they provide can be regarded as reliable. A conclusion for the descriptive analysis is that the findings drawn from the collected data will be a comprehensive and credible representation of how H&S management is influenced by the legal system (i.e. CMCHA) in the UK construction SMEs.

6.4.2 Categorisation of SMEs in the study

The responses of the survey questionnaire came from different categories of SMEs. As described in Section 6.3, these organisations assume different roles in the construction industry (such as general contractors, design-build, specialist contractors, and construction management) working in different sectors ranging from residential building, civil engineering, repair and maintenance and non-residential buildings. Table 6-10 illustrates a breakdown of the type of construction organisations that participated in the study categorised by size (i.e. large, medium, small and micro). The classification was individually assessed based on the definition of SME adopted by this research (see Section 2.8.2).

Table 6-10. Category of SMEs of respondents.

Type of Construction Organisation	Frequency	Percentage (%)
Large	2	2.1
Medium	23	24.0
Small	49	51.0
Micro	22	22.9
Total	**96**	**100**

6.5 Occupational Health and Safety Management Systems: Level of Implementation in SMEs

6.5.1 Overall measurement of implementation

Section B of the survey questionnaire was developed with the intention of measuring the level of implementation of an occupational health and safety management system in construction SMEs. The section comprised 30 items divided into four categories, aimed at measuring the different stages of a Plan-Do-Check-Act (PDCA) cycle applied to health and safety management. The participants were asked to give their judgment of H&S practice of SMEs in the UK construction industry in a 5-point Likert scale ranging from strongly disagree to strongly agree.

The level of implementation of an occupational health and safety management system was measured with a percentage score calculated for each of the participants based on the sum of the numeric values of the items (Strongly disagree=1; Strongly agree=5). Considering that this sum would result in a minimum value of 30 and a maximum value of 150, the individual score (

Table 6-11) for each of the participants was obtained by scaling the data using normalization. These values were calculated on a 0 to 1 range using a simplified formula for a min-max scaling (Jain and Bhandare, 2011):

$$\mathrm{z} = \frac{x - \min{(x)}}{\max{(x)} - \min{(x)}}$$

Where:

z = normalized value

x = original value

min (x) = minimum value for x

max (x) = maximum value for x

The scores of all participants are then used to calculate an overall mean score. As explained in Hofstede (2001), the mean was used to interpret the results as the nature of the data was such that the mean is a close estimate of the median. The results show a mean score of 73.11% with a standard deviation of 19.13%. A similar approach has been carried out to measure health and safety commitment in UK construction SMEs (e.g. Arewa, 2014).

As stated in the methodology chapter, a total of 6 items out of the 30 items addressed in this section of the questionnaire were randomly reversed to counteract the effect of "yea-sayers" and "nay-sayers" (Farrell, 2011). For example, Q7 in Section B of the questionnaire was presented to the respondents as 'Do not ensure compliance with the law'. This implicates that the numeric values of the Likert scale used in this part of the questionnaire had to be reversed in order to express the results of the section using means values. In a hypothetical case of having a response scale from 1-5, if a reversed question resulted with a score of 1, the value for the analysis of this question would be in the same scale. The list of reversed questions in the questionnaire is provided in Appendix E.

Table 6-11. Measurement of level of implementation of an occupational H&S management system in construction SMEs (QB1 – QB30).

Participant	Total Score	Percentage Score	Participant	Total Score	Percentage Score	Participant	Total Score	Percentage Score
P1	139	90.83%	**P33**	103	60.83%	**P65**	138	90.00%
P2	70	33.33%	**P34**	107	64.17%	**P66**	140	91.67%
P3	126	80.00%	**P35**	89	49.17%	**P67**	97	55.83%
P4	141	92.50%	**P36**	99	57.50%	**P68**	114	70.00%
P5	145	95.83%	**P37**	132	85.00%	**P69**	129	82.50%
P6	113	69.17%	**P38**	127	80.83%	**P70**	120	75.00%
P7	147	97.50%	**P39**	93	52.50%	**P71**	104	61.67%
P8	129	82.50%	**P40**	120	75.00%	**P72**	137	89.17%
P9	77	39.17%	**P41**	98	56.67%	**P73**	143	94.17%
P10	114	70.00%	**P42**	106	63.33%	**P74**	123	77.50%
P11	131	84.17%	**P43**	150	100.00%	**P75**	76	38.33%
P12	111	67.50%	**P44**	123	77.50%	**P76**	99	57.50%
P13	97	55.83%	**P45**	142	93.33%	**P77**	148	98.33%
P14	138	90.00%	**P46**	107	64.17%	**P78**	148	98.33%
P15	84	45.00%	**P47**	92	51.67%	**P79**	97	55.83%
P16	99	57.50%	**P48**	132	85.00%	**P80**	150	100.00%
P17	137	89.17%	**P49**	109	65.83%	**P81**	94	53.33%
P18	115	70.83%	**P50**	138	90.00%	**P82**	94	53.33%
P19	103	60.83%	**P51**	101	59.17%	**P83**	93	52.50%
P20	140	91.67%	**P52**	83	44.17%	**P84**	90	50.00%
P21	116	71.67%	**P53**	149	99.17%	**P85**	116	71.67%
P22	65	29.17%	**P54**	149	99.17%	**P86**	114	70.00%
P23	128	81.67%	**P55**	140	91.67%	**P87**	147	97.50%
P24	123	77.50%	**P56**	124	78.33%	**P88**	102	60.00%
P25	149	99.17%	**P57**	115	70.83%	**P89**	99	57.50%
P26	124	78.33%	**P58**	127	80.83%	**P90**	145	95.83%
P27	144	95.00%	**P59**	134	86.67%	**P91**	126	80.00%
P28	121	75.83%	**P60**	111	67.50%	**P92**	62	26.67%
P29	143	94.17%	**P61**	143	94.17%	**P93**	111	67.50%
P30	115	70.83%	**P62**	96	55.00%	**P94**	128	81.67%
P31	137	89.17%	**P63**	124	78.33%	**P95**	134	86.67%
P32	47	14.17%	**P64**	147	97.50%	**P96**	106	63.33%

Mean = 73.11%   Median = 75.42%   Std. Dev. = 19.13   Min=14.17%   Max=100.00%

Moreover, the mean score of the participants was also used to analyse the four stages of the PDCA cycle applied to health and safety management:

(i) Plan – Question B1 to Question B8

(ii) Do – Question B9 to Question B19

(iii) Check – Question B20 to Question B26

(iv) Act – Question B27 to Question B30

This part of the analysis provides descriptive statistics for each of the stages of the cycle including the mean, median, mode, standard deviations, minimum and maximum. Also, the analysis measures the interrater agreement index for individual items (rWG) and for multi-items (rWGj) in order to determine the degree of agreement among participants. Conventionally, rWG values ≥ 0.70 is considered evidence of strong agreement (LeBreton and Senter, 2008). However, it has been suggested that far more stringent standards are needed to interpret agreement indices (Harvey and Holl, 2004). Cohen, Doveh and Eick (2001) reported that rWG values vary considerably as a function of group size and number of response items and thus implying that the conventional value of 0.70 may not be reasonable for all configurations. Taking this into consideration, the rWG values for significant agreement were estimated based on a sample size of 96 and a 5-point scale. Based on 5,000 simulation runs, rWG values of 0.11, 0.15 and 0.20 are the 90%, 95% and 99% confidence interval estimates respectively for a group size of 96 and a 5-point scale. Hence, rWG values > 0.20 are evidence of significant agreement at $p < 0.01$.

6.5.2 Implementation of H&S management system: Plan Stage (QB1 - QB8)

Table 6-12 shows the analysis of the implementation of the 'Plan' stage of a H&S management system among SMEs. This category encompassed the first 8 statements of the section of the survey questionnaire; one of them expressed as a reversed statement. The assessment shows that the participants '*agree*' that SMEs are carrying out the essential tasks of a planning stage of a H&S management system. However, the intention of seeking a fair balance between H&S, time, cost and quality in construction works resulted slightly below the 'agree' point of the scale (mean rating=3.53; Std. Dev. = 1.15). From Table 6-12 it is evident that all the single-item inter-rater agreement indices (rWG) exceed 0.20 which is the rWG value for significant agreement at $p<0.01$. This means that there is significant agreement amongst participants as to the extent to which SMEs are currently carrying out the tasks of the '*Plan*' stage of the H&S PDCA cycle. As an approach to generalise the stage with a single score, a mean was calculated considering the 8 different tasks. The average mean score for the '*Plan*' stage is 4.11 (with Std. Dev. 0.94) which equates to 77.80%. A multi-item inter-rater agreement index (rWGj) of 0.91 indicates that the mean rating is a credible representation and can be interpreted with confidence.

From the overall assessment of the '*Plan*' stage (shown in Table 6-12), it can be indicated that SMEs currently implement, albeit to a certain level, the tasks that constitute the planning stage of health and safety management system. These results are not surprising as the H&S planning requirements of construction projects are known for being highly demanding.

Table 6-12. Descriptive statistics and inter-rater agreement indices of the extent to which participants agree or disagree that SMEs are carrying out the given statements for the 'Plan' stage (QB1 - QB8).

	Plan	Mean*	Median	Mode	Std Dev	Min	Max	rWG**
B1	Have a formal H&S policy	4.52	5.00	5.0	0.74	1.00	5.00	0.73
B2	Ensure the H&S policy is comprehensive to all	4.32	4.00	5.0	0.79	1.00	5.00	0.69
B3	Have a defined management structure within the organisation	4.20	4.00	4.0	0.85	1.00	5.00	0.64
B4	Make sure the H&S policy is implemented	4.14	4.00	5.0	0.95	1.00	5.00	0.55
B5	Strongly consider H&S in pre-plan/pre-design stages	3.98	4.00	5.0	1.06	1.00	5.00	0.44
B6	Generate H&S plans for the works to be carried out	4.20	4.00	5.0	0.87	2.00	5.00	0.63
B7	Do not ensure compliance with the law	4.01	4.00	5.0	1.15	1.00	5.00	0.34
B8	Seek a fair balance between H&S, time, cost and quality	3.53	4.00	4.0	1.15	1.00	5.00	0.38
	Stage Mean	**4.11**			**0.94**		**rWGj*** **	**0.91**

Notes: *Mean ratings are based on a 5-point scale (1- Strongly disagree, 2- Disagree, 3- Neither agree or disagree, 4- Agree, 5- Strongly agree). **rWG indices are based on a uniform null distribution. Based on 5,000 simulation runs, rWG values of 0.11, 0.15 and 0.20 are the 90%, 95% and 99% confidence interval estimates respectively for a group size of 96 and a 5-point scale. Hence rWG values > 0.20 are evidence of significant agreement at $p < 0.01$. ***rWGj values of 0.25, 0.30 and 0.38 are the 90%, 95% and 99% confidence interval estimates respectively for a group size of 96, a 5-point scale and 8 measured items. Hence rWGj values > 0.38 are evidence of significant agreement at $p < 0.01$.

Concerning the tasks covered on this stage, the development of a health and safety policy, which had been previously identified as a key health and safety behaviour in SMEs (HSE, 2007), was the main task assessed in this section. Considering that it is a mandatory requirement under the Health and Safety at Work etc. Act 1974 and The Management of Health and Safety at Work Regulations 1999 to establish a H&S policy, it is unsurprising to find that respondents strongly agreed with the statement that SMEs currently have a formal H&S policy in place. However, it is important to understand that the existence of a H&S policy document does not necessarily give indication of good practice. Thus, this study argues that a H&S policy must be comprehensive regarding the terms used and the content. This would enhance accessibility to all those who are affected by it (e.g. employees, sub-contractors and clients). In this regard, the results indicate agreement that SMEs are indeed making sure H&S policies are comprehensive to all.

Participants also agreed that there is a defined organisational management structure within construction SMEs. This might be an indication that operations are executed in such a manner as to ensure the health, safety and welfare of employees and others who may be affected by these operations. Although the implementation of a management structure enhances safety performance (Mearns, Whitaker and Flin, 2003; Fernández-Muñiz, Montes-Peón and Vázquez-Ordás, 2009), the continuous association of SMEs with the high rate of fatalities in the industry (LFS, 2016) gives the indication of potential flaws on the implementation of these systems. In the same line of results, respondents also agreed that SMEs consider health and safety in the pre-plan and pre-design stages of construction projects and generate H&S plans for the works to be carried out. This is also an expected result considering that the CDM 2015 assigns a duty to the principal designer to plan, manage and monitor health and safety at the pre-construction phase of a project. On the whole, this an important feature to evidence as lack of research on the inclusion of H&S during the early stages of project planning has been reported by researchers (Hare, Cameron and Roy Duff, 2006).

Although compliance with health and safety regulations has been linked with adverse costs to SMEs (BERR, 2008; Arewa and Farrell, 2012; Arewa, 2014; Wong, Gray and Sadiqui, 2015; Sampaio, Saraiva and Domingues, 2012), the findings show that these organisations are currently ensuring compliance with the legal requirements to manage health and safety.

It was also observed that seeking balance between the constraints of a construction project (e.g. health and safety, time, cost and quality) resulted in a lower score when compared to the other factors of this stage. According to Rezaian (2011), trade-offs between these elements is one of the highly important issues in project management and has been ever taken into consideration by project managers. Thus, it is not a surprise to come out with this result. Considering that health and safety, time, cost and quality should maintain a balance along the lifecycle of a project (Noval, 2009; Hu and He, 2014; Lester, 2014), the result might also evidence issues in project accomplishment among SMEs.

6.5.3 Implementation of H&S management system: Do Stage (QB9 - QB19)

The following 11 questions of the survey questionnaire are related to the second stage ('Do') of a H&S PDCA management cycle. Table 6-13 shows that all the statements are bordering on a score of 4 which is the baseline of the 'agree' point of the given Likert scale. With rWG values greater than 0.20, significant agreement is evident that each of the mentioned actions are taking place in the management of H&S among SMEs. Similar to the previous stage, a mean was calculated to rate the stage of the cycle as a whole. The average mean score for the 'Do' stage is 3.87 (with Std. Dev. 1.04). A multi-item inter-rater agreement index (rWGj) of 0.90 indicates that the mean rating of the 'Do' stage is a credible representation (rWGj > 0.41) and can be interpreted with confidence ($p < 0.01$).

Table 6-13. Descriptive statistics and inter-rater agreement indices of the extent to which participants agree or disagree that SMEs are carrying out the given statements for the 'Do' stage (QB9 - QB19).

	Do	Mean*	Median	Mode	Std Dev	Min	Max	rWG**
B9	Do not carry out risk assessments for the works	4.10	4.00	5.00	1.08	1.00	5.00	0.42
B10	Implement a defined procedure to carry out risk assessments	3.78	4.00	4.00	1.09	1.00	5.00	0.41
B11	Have a formal H&S training programme for employees	3.74	4.00	4.00	1.10	1.00	5.00	0.40
B12	Do not make efforts to secure trust of employees	3.79	4.00	4.00	1.10	1.00	5.00	0.39
B13	Ensure high standard welfare conditions	3.80	4.00	4.00	1.08	1.00	5.00	0.41
B14	Involve workers and/or employees in H&S matters	3.70	4.00	4.00	1.10	1.00	5.00	0.40
B15	Secure an adequate flow of information within the organisation	3.81	4.00	4.00	0.97	2.00	5.00	0.53
B16	Designate clear H&S roles and responsibilities	3.91	4.00	4.00	0.90	2.00	5.00	0.60
B17	Do not assure employees are competent enough to perform the works	3.96	4.00	5.00	1.15	1.00	5.00	0.38
B18	Seek external H&S advice	3.96	4.00	4.00	0.96	1.00	5.00	0.54
B19	Provide adequate resources to ensure a reasonably practicable H&S performance (tools, equipment, specialised skills, infrastructure, technology)	4.02	4.00	4.00	0.91	1.00	5.00	0.59
	Stage Mean	**3.87**			**1.04**		**rWGj*** **	**0.90**

Notes: *Mean ratings are based on a 5-point scale (1- Strongly disagree, 2- Disagree, 3- Neither agree or disagree, 4- Agree, 5- Strongly agree). **rWG indices are based on a uniform null distribution. Based on 5,000 simulation runs, rWG values of 0.11, 0.15 and 0.20 are the 90%, 95% and 99% confidence interval estimates respectively for a group size of 96 and a 5-point scale. Hence rWG values > 0.20 are evidence of significant agreement at p < 0.01. ***rWGj values of 0.27, 0.33 and 0.41 are the 90%, 95% and 99% confidence interval estimates respectively for a group size of 96, a 5-point scale and 11 measured items. Hence rWGj values > 0.41 are evidence of significant agreement at p < 0.01.

From the overall assessment of the '*Do*' stage (shown in Table 6-13. Descriptive statistics and inter-rater agreement indices of the extent to which participants agree or disagree that SMEs are carrying out the given statements for the 'Do' stage (QB9 - QB19).), it can be observed that SMEs also implement, although with a lower mean score when compared to the '*Plan*' stage, the basic elements required for this phase of the management cycle. When assessed individually, the respondents expressed agreement that each of the identified elements is currently being implemented among construction SMEs. Among these elements, carrying out risk assessments for the works resulted with the higher score, evidencing compliance with *Regulation 3* of the *Management of Health and Safety at Work Regulations 1999*. However, the fact that SMEs are currently carrying out risks assessments for their works does not necessarily assure that accidents will not occur. Risk management in construction is considered a tedious task (Zavadskas, Turskis and Tamošaitiene, 2010) and the adequacy of the assessments will rest on the commitment to a defined process and the knowledge on risk identification and mitigation (Loosemore and Raftery, 2012). In fact, Ying et al. (2015) identified wrong perception and underestimation of risks as one of the main barriers to promote good H&S practices. When compared to the task of implementing risks assessments, applying a defined procedure to carry out these assessments resulted with a slightly lower score, giving some insights that SMEs might lack of competence in managing risks.

The '*agree*' score can be also observed for having a H&S training programme particularly focused on employees. After acknowledging the critical role of training in H&S (Cohen et al., 1998; Burke and Sarpy, 2003; Colligan and Cohen, 2004), it is interesting to observe that SMEs are indeed implementing training as one of the methods to enhance safety and health in the workplace. Along with training, the results show that SMEs are implementing further tasks concerning the '*Do*' stage of the cycle such as: securing trust of employees, providing high standard welfare conditions and resources, designating clear roles and responsibilities and assuring competency in their employees. Also, there is evidence that SMEs are following the recommendation given by the HSE (HSE, 2013d) of seeking external H&S advice.

A surprising finding is that despite being a legal requirement (HSE, 2013d), involving workers and employees in H&S matters was rated with the lowest score in this section. This confirms that there is currently an absence of representation by workforce in H&S matters as reported by Arocena and Nunez (2010). The fact that successful safety programmes largely depend on employee involvement (Peyton and Rubio, 1991; Vredenburgh, 2002; Fang et al., 2004; Abudayyeh et al., 2006; Stranks, 2007) gives an indication to SMEs that this is an aspect to be urgently improved.

6.5.4 Implementation of H&S management system: Check Stage (QB20 - QB26)

'Check' comprises the third stage of the PDCA cycle. Questions 20 to 26 were asked to seek the views of the participants on whether SMEs perform control measures within their H&S management strategies. Table 6-14 shows a breakdown of agreement from participants to all the questions asked in this category (rWG > 0.20). While most of the H&S tasks addressed in this section can be rounded to the 'Agree' point in the Likert scale (4), 'monitoring cases of ill health' is more closely to 'Neither agree or disagree' in the same scale (3). With an overall percentage score of 70.31% (3.81 mean score) and a Std. Dev. of 1.10, it is evidenced that participants agree that SMEs implement control measures in their approach to manage H&S. A multi-item inter-rater agreement index (rWGj) of 0.82 indicates that the overall mean rating is a credible representation (rWGj > 0.37) and can be interpreted with confidence ($p < 0.01$).

Table 6-14. Descriptive statistics and inter-rater agreement indices of the extent to which participants agree or disagree that SMEs are carrying out the given statements for the 'Check' stage (QB20 - QB26).

	Check	Mean*	Median	Mode	Std Dev	Min	Max	rWG**
B20	Do not carry out site inspections	4.06	4.00	5.00	1.14	1.00	5.00	0.35
B21	Report incidents in compliance with RIDDOR	4.14	4.00	5.00	0.97	2.00	5.00	0.53
B22	Document incident data	3.86	4.00	4.00	1.02	1.00	5.00	0.48
B23	Keep records of the progress of implemented safety programmes (e.g. training, meetings)	3.75	4.00	4.00	1.07	1.00	5.00	0.43
B24	Analyse the causes of accidents, incidents or near misses	3.79	4.00	5.00	1.16	1.00	5.00	0.33
B25	Monitor cases of ill health	3.42	4.00	4.00	1.18	1.00	5.00	0.30
B26	Carry out periodic audits of the H&S management system	3.67	4.00	4.00	1.16	1.00	5.00	0.33
	Stage Mean	**3.81**			**1.10**		**rWGj*** **	**0.82**

Notes: *Mean ratings are based on a 5-point scale (1- Strongly disagree, 2- Disagree, 3- Neither agree or disagree, 4- Agree, 5- Strongly agree). **rWG indices are based on a uniform null distribution. Based on 5,000 simulation runs, rWG values of 0.11, 0.15 and 0.20 are the 90%, 95% and 99% confidence interval estimates respectively for a group size of 96 and a 5-point scale. Hence rWG values > 0.20 are evidence of significant agreement at p < 0.01. ***rWGj values of 0.23, 0.29 and 0.37 are the 90%, 95% and 99% confidence interval estimates respectively for a group size of 96, a 5-point scale and 7 measured items. Hence rWGj values > 0.37 are evidence of significant agreement at p < 0.01.

The overall assessment of the third stage, *'Check'*, indicates that SMEs are also performing control measures along the implementation of their health and safety management strategies (see Table 6-14. Descriptive statistics and inter-rater agreement indices of the extent to which participants agree or disagree that SMEs are carrying out the given statements for the 'Check' stage (QB20 - QB26).). Differing from the previous stages, it can be observed that a lone task was not rated within the agree scale of the survey (i.e. agree, strongly agree). Respondents indicated that they *'neither agree or disagree'* with the statement that SMEs monitor cases of ill health in the construction industry. This is clear evidence that less attention is being paid to health-related issues in the industry as previously identified by Boschman et al. (2011). This finding is consistent with the study by Stocks et al. (2011) which found that labourers in building and construction trades have significantly increased incidence of work-related ill-health (e.g. respiratory, skin and musculoskeletal disorder). More recently, statistics published by the HSE give similar indications (HSE, 2017b).

The remaining factors are recognised as being implemented (*'agree'*) in the management of health and safety in SMEs. Among these are carrying site inspections, documenting incident data and analysing the causes of accidents, incidents or near misses. Since it is a legal requirement through the Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR), it is not surprising that SMEs are in fact reporting workplace incidents. Opposed to previous literature that recognised under-reporting as a significant problem in construction and other industries (Taylor Moore et al., 2013), including certain workplace accidents, occupational diseases and certain dangerous occurrences. This is an interesting finding as incident reporting is indispensable to obtain data to analyse and find out why incidents occur.

Considering that auditing the performance of H&S management systems is not a mandatory requirement, it was not expected to find that SMEs are carrying out periodic audits. This could bring positive outcomes for the industry as Ai Lin Teo and Yean Yng Ling (2006) argued that safety auditing is one of the major elements of a safety management system. They reported that audits promote safe work practices and help to determine the strengths and weaknesses of a safety program.

6.5.5 Implementation of H&S management system: Act Stage (QB27 - QB30)

The PDCA cycle concludes at the 'Act' stage. The final 4 questions address the actions taken to improve the flaws of a H&S management system. The assessment shows that the participants 'agree' that SMEs are taking actions to improve their H&S management system. From Table 6-15 it is evident that all the single-item inter-rater agreement indices (rWG) exceed 0.20 which is the rWG value for significant agreement at p<0.01. Following the approach taken in the other stages, an overall mean is calculated to make a generalisation of the stage. The average mean score for the 'Act' stage is 3.89 (with Std. Dev. 1.02) which equates to 72.33%. A multi-item inter-rater agreement index (rWGj) of 0.78 indicates that the mean rating is a credible representation and can be interpreted with confidence.

Table 6-15. Descriptive statistics and inter-rater agreement indices of the extent to which participants agree or disagree that SMEs are carrying out the given statements for the 'Act' stage (QB27 - QB30).

	Act	Mean*	Median	Mode	Std Dev	Min	Max	rWG**
B27	Do not use accidents investigation reports to plan remedial actions	3.82	4.00	5.00	1.10	1.00	5.00	0.39
B28	Revisit the policy documents periodically	3.86	4.00	4.00	1.03	1.00	5.00	0.47
B29	Consider errors and external experience to revise H&S plan	3.80	4.00	4.00	1.00	1.00	5.00	0.50
B30	Ensure lessons learned are put into practice	4.08	4.00	5.00	0.95	2.00	5.00	0.55
	Stage Mean	**3.89**			**1.02**		**rWGj*** **	**0.78**

Notes: *Mean ratings are based on a 5-point scale (1- Strongly disagree, 2- Disagree, 3- Neither agree or disagree, 4- Agree, 5- Strongly agree). **rWG indices are based on a uniform null distribution. Based on 5,000 simulation runs, rWG values of 0.11, 0.15 and 0.20 are the 90%, 95% and 99% confidence interval estimates respectively for a group size of 96 and a 5-point scale. Hence rWG values > 0.20 are evidence of significant agreement at p < 0.01. ***rWGj values of 0.19, 0.24 and 0.31 are the 90%, 95% and 99% confidence interval estimates respectively for a group size of 96, a 5-point scale and 4 measured items. Hence rWGj values > 0.31 are evidence of significant agreement at p < 0.01.

The overall assessment of the *'Act'* stage, (shown in Table 6-15) gives indication that SMEs are currently carrying out the elements that constitute the ending stage of a PDCA management cycle. Consistent with the overall mean, all the individual tasks assessed were rated with the *'agree'* level of the given scale. This is not a surprise result as the cited tasks complement each other.

Amongst all, participants gave the highest score to the statement that SMEs ensure lessons learned are put into practice. A plausible reason for this is that, according to the results, these types of organisations are using the results of accident investigations and near-miss reports to improve the way they manage health and safety in the workplace. Yet, the active participation of SMEs in accidents occurrence puts into question whether these organisations learn successfully. Drupsteen and Guldenmund (2014) had previously identified this issue in organisations and therefore indicated the processes needed to learn from incidents. Although not focusing on SMEs, similar works have been carried out by Lukic, Littlejohn and Margaryan (2012), Margaryan, Littlejohn and King (2014) and Stanton, Margaryan and Littlejohn (2017). The analysis of this stage also shows that SMEs revisit the policy documents periodically and consider errors and external experience to revise their H&S strategy.

6.5.6 Implementation of H&S management system: Discussion

From the assessment of the level of implementation of a H&S management system in construction SMEs, it is a surprise that none of the identified tasks is generally perceived as not being carried out. Considering the vulnerability of SMEs to adverse health and safety incidents (Arewa and Farrell, 2012) and the financial challenge of committing to health and safety (Sampaio, Saraiva and Domingues, 2012; Arewa and Farrell, 2012; Arewa, 2014; Wong, Gray and Sadiqui, 2015), it is surprising that SMEs are currently implementing what the Health and Safety Executive (HSE, 2013d) define as an overall structured system in the management of health and safety in the workplace. The mean scores of each of the stages of a PDCA safety management system are summarised in Table 6-16 along with their standard deviation. For a better comprehension of the results, the percentage score of each of the stages was displayed in a radar chart using Ms. Excel and is shown in Figure 6-1.

Table 6-16. Overall score of the level of implementation of PDCA cycle stages by SMEs

Stages	Overall Mean	Std Dev	Percentage (%)
Plan	4.11	0.94	77.80
Do	3.87	1.04	71.76
Check	3.81	1.10	70.31
Act	3.89	1.02	72.33

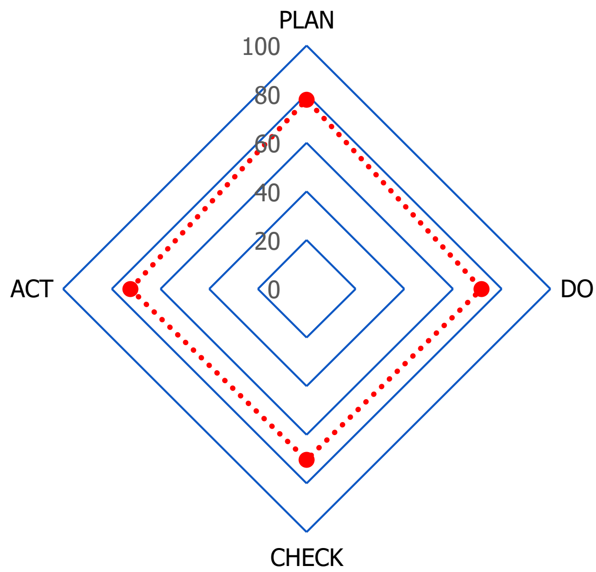

Figure 6-1. PDCA stages overall implementation score

The overall assessment enables comparison among the different stages of a health and safety management system. When listing the elements of OHSMS, Hughes and Ferrett (2016) argued that it is of great importance to give continuity along the cycle to enhance safety performance in organisations. This condition is not appreciated in the results. For instance, the findings revealed that the first stage, 'Plan', resulted with a higher score when compared to the other stages. This gives the impression that construction SMEs implement the tasks related to the planning of health and safety more effectively than the tasks of the subsequent stages.

The lack of continuity along the implementation of the cycle could be attributable to the barriers that SMEs need to overcome to promote good health and safety practice. These barriers have been previously identified by numerous studies. An example is Ying et al. (2015), who from a questionnaire survey identified lack of safety awareness, cost and time as main barriers.

Conveniently, this study relates to these identified barriers. When looking at the 'Planning' stage, it is evident that these tasks do not incur into significant use of resources. It is now evident that this stage is mainly focused on establishing a H&S policy and developing an execution plan which is done internally in the organisation and usually reviewed annually. But on the other hand, the subsequent stages require significant allocation of resources such as time and money to be implemented efficiently. For instance, H&S education and training is more time consuming and, in effect, more expensive when compared to developing a safety policy.

The assessment also revealed that the lowest score within the cycle was the 'Check' stage. This implies that there are some tasks within this stage which have been rated with a lower score when compared to the other tasks. It is the case of 'monitoring ill cases' which resulted with the lowest score among all statements, negatively affecting the overall score of the 'Check' stage. As previously discussed, this is consistent with the lack of improvement in the rate of all work-related ill health and musculoskeletal disorders (MSD) reported in the UK construction industry over the last decade (HSE, 2017b). Regardless 'Check' being the lowest rated amongst the stages of the cycle, an overall score of 70.31 indicates that there is still an acceptable level of implementation of this stage among construction SMEs. The remaining stages, 'Plan', 'Do' and 'Act' were rated with higher scores.

6.6 Level of Awareness of Employers' H&S Duties of Care to Employees and Persons Others than Employees: QC1 - QC8; QD1 - QD2

6.6.1 Results

It can be argued that knowledge is an antecedent of displays of behaviours, with accidents and incidents being the consequences of behaviour in the construction industry. The third part of the questionnaire intended to determine the extent to which SMEs employers are aware of their duties of care to their employees and to persons other than employees. Table 6-17 indicates a summary of the assessment of the employers' level of awareness of their duties of care while managing a construction SME. For each of the duties, awareness is measured when the respondents indicated the extent to which they agree or disagree that SMEs are carrying out the given H&S duties, as explained in Section 5.3.2.2. The ratings ranged from strongly disagree (1) to strongly agree (5). From the overall assessment given by Table 6-17, all of the identified duties are generally perceived as being carried out by employers in SMEs. Although the aggregated ratings by individual respondents (i.e. mean ratings) indicate some variation among the cited duties, the respondents have expressed a certain level of agreement in regard to the implementation of the duties. Explaining to employees who is responsible for the identified risks resulted with the lowest level of awareness among the respondents with a mean rating of 3.94 (Std. Dev. = 0.90). Also, from Table 6-17, the duty of explaining to employees how risks are being controlled resulted with the highest level of awareness with a mean rating of 4.55 (Std. Dev. 0.67).

Table 6-17. Descriptive statistics and inter-rater agreement indices of the level of awareness of employers' duties of care to employees and persons other than employees (QC1 - QC8; QD1 - QD2).

	Awareness of employers' duties of care to employees and persons other than employees	*Mean	Median	Mode	StdDev	Min	Max	rWG	Strongly disagree	Disagree	Neither agree of disagree	Agree	Strongly agree
C1	Explain to employees, in an understandable way, how risks are being controlled	3.95	4.00	4.00	0.86	2.00	5.00	0.63				X	
C2	Explain to employees who is responsible for the identified risks	3.94	4.00	4.00	0.90	1.00	5.00	0.59				X	
C3	The provision of safety equipment and protective clothing free of costs	4.41	5.00	5.00	0.76	2.00	5.00	0.71				X	
C4	Provide H&S training free of costs to employees	4.31	4.66	5.00	0.87	1.00	5.00	0.62				X	
C5	Provide toilets, washing facilities and drinking water	4.24	4.00	5.00	0.94	1.00	5.00	0.55				X	
C6	Provide adequate first-aid facilities and instructions	4.18	4.00	5.00	0.95	1.00	5.00	0.55				X	
C7	Have an up-to-date Employer's Liability certificate	4.55	5.00	5.00	0.67	2.00	5.00	0.77					X
C8	Display the Health and Safety Law poster	4.32	5.00	5.00	0.84	2.00	5.00	0.65				X	
D1	There is a duty owed as occupier of construction sites	4.16	4.00	4.00	0.83	1.00	5.00	0.65				X	
D2	There is a duty owed to persons other than employees	4.20	4.00	4.00	0.87	1.00	5.00	0.62				X	
	Overall	**4.22**	**4.37**	**5.00**	**0.85**	**1.00**	**5.00**	**-**					

Notes: *Mean ratings are based on a 5-point scale (1- Strongly disagree, 2- Disagree, 3- Neither agree or disagree, 4- Agree, 5- Strongly agree). **rWG indices are based on a uniform null distribution. Based on 5,000 simulation runs, rWG values of 0.11, 0.15 and 0.20 are the 90%, 95% and 99% confidence interval estimates respectively for a group size of 96 and a 5-point scale. Hence rWG values > 0.20 are evidence of significant agreement at $p < 0.01$.

The values of the standard deviation are relatively small compared to the mean ratings and this indicate a low dispersion of the results. However, to interpret the mean ratings with much confidence, evidence of agreement amongst the participants is necessary. As in the previous section of this chapter, the interrater agreement index for individual items (rWG) was also calculated in this assessment to demonstrate the degree of consensus among raters. The presence of significant agreement means that the defined aggregated (i.e. mean) ratings can be considered as being credible representations of the respondents' individual assessments of the awareness of the main H&S duties of care of the employers in SMEs. The calculated rWG value for each duty of care is indicated in Table 6-17.

It is evident that all the rWG indices for the duties of care exceed the value of 0.20. This indicates that there is significant agreement amongst the participants as to the employers' degree of awareness of their H&S duties of care. Therefore, the mean ratings are credible representations of the respondents' assessments and can be interpreted with confidence.

In order to ensure conformity with the scale so as to help in the interpretation of the results, the mean ratings are rounded to the nearest point on the 5-point scale for the overall assessment. This assessment shows that the participants agree that SMEs are aware of the main H&S duties of care owed as an organisation.

6.6.2 Discussion

From the overall assessment given by Table 6-17, none of the duties of care was rated below the level of agreement in the given scale. In contrast with the findings reported by McKinney (2002), this evidences that construction SMEs are generally aware of their main legal obligations as employers, in this case, to their employees and persons other than employees. These findings could give an indication that authorities have, in some way, improved the barriers of communicating and engaging with SMEs over the course of time.

Considering that communication has been identified as a barrier to health and safety practice in SMEs (Arewa, 2014), it was unexpected to find that SMEs are carrying out tasks that give indication of good communication practice. For instance, participants agreed that SMEs explain to employees how the risks in the workplace are being managed. Similarly, the results show that SMEs explain to employees who is responsible for the identified risks. From a different perspective, these results might imply that SMEs are successfully implementing key components of safety risk management.

The results also confirmed that SMEs are providing H&S training and personal protective equipment (PPE) to their employees free of charge as required by the regulations. Although the implementation of these elements incurs significant costs to SMEs, they are strictly necessary to control risks. Participants also agreed that SMEs are providing toilets, washing facilities, drinking water and adequate first-aid facilities and instructions. Again from Table 6-17, it is evident that SMEs are displaying the Health and Safety Law poster and have an up-to-date Employer's Liability. The latter resulted with a *'strongly agree'* score, being the highest among the defined duties. A plausible reason for this is that SMEs are aware of the risk of being fined £2,500 for every day the business is not properly insured (HSE, 2012), which could have a great impact on their financial status.

In addition to the duties owed to employees, SMEs owe other types of duties. There have been cases in which non-employees have claimed compensation for injuries after trespassing a property. Moreover, there have been convictions for the death of non-employees in construction sites, such as the case of Monavon Construction Ltd (BBC News, 2016) where two men died after falling into a building site. It is thus unsurprising to see, from Table 6-17, that SMEs are aware they owe a duty as occupier of construction sites and to persons other than employees.

It is not the intention of this study to make the generalisation that SMEs are entirely aware of the H&S duties required by regulations. The duties of care of employers to their employees assessed in this research represent a section from the vast list of H&S duties that SMEs need to comply with. In fact, statistics reports on H&S performance gives indication that there are statutory requirements which are currently not being implemented by SMEs.

The consistent involvement of SMEs in the occurrence of accidents is an indication that accident prevention requires further actions than just raising awareness of the duties of care. Research on SMEs argue that these types of organisations fail to abide by good health and safety practice even when they can be seen to have an effective understanding of the regulations (HSE, 2007). As mentioned by Arocena and Nunez (2010), lack of commitment is one of the difficulties SMEs face with regard to the management of health and safety and could be linked to the poor performance in implementing a good safety practice. This evidences an existing gap between knowledge and implementation.

6.7 The Influence of Prosecution, Conviction and Further Factors in Construction SMEs: QE1 - QE11

6.7.1 Results

Section E of the survey was intended to assess the degree of influence of the identified factors, most of them related to H&S prosecutions and convictions on the H&S performance of SMEs. The summary of the assessment is shown in Table 6-18. For each of the factors the respondents indicated the degree of influence over the way SMEs manage health and safety. Unlike the previous sections, the ratings ranged from 0 (no influence) to 4 (vast influence). Although the aggregated ratings by individual respondents (i.e. mean ratings) indicate some variation among the factors, the respondents have expressed that they all have a moderate influence on the way SMEs manage health and safety. The issue of improvement or prohibition notices and the reputation of the organisation have the greatest influence in the H&S performance of SMEs with a mean rating of 3.26 (Std. Dev. 0.96, 0.86). Reductions in premiums are perceived as having the least influence on the way SMEs manage health and safety with a mean rating of 2.58 (Std. Dev. = 1.09).

The values of the standard deviation indicate a low dispersion of the results when compared to the mean rating. Again, to interpret the mean ratings with much confidence, evidence of agreement amongst the participants is necessary. The interrater agreement index for individual items (rWG) was also calculated in this assessment to demonstrate the degree of consensus among raters. The calculated rWG value for each of the factors is indicated in Table 6-18. It is evident that all the rWG indices for the duties of care exceed the value of 0.20 which is the rWG threshold value for significant agreement at $p < 0.01$ for a group size of 96 and 5 item scale.

Table 6-18. Descriptive statistics and inter-rater agreement indices of the degree of influence of H&S prosecutions, convictions and further factors on the way SME manage health and safety (QE1 - QE11).

	Factors with potential to influence H&S performance	*Mean	Median	Mode	StdDev	Min	Max	rWG	Degree to influence H&S management in SMEs				
									None (0)	Minor (1)	Some (2)	Moderate (3)	Vast (4)
E1	The issue of improvement or prohibition notices	3.26	3.13	4.00	0.86	0.00	4.00	0.63				X	
E2	Past cases of prosecutions and convictions of other organisations	2.59	3.00	3.00	0.99	0.00	4.00	0.51				X	
E3	The risk of being prosecuted for corporate manslaughter	3.19	4.00	4.00	1.06	0.00	4.00	0.44				X	
E4	The risk of being prosecuted as an individual	3.18	4.00	4.00	1.09	0.00	4.00	0.40				X	
E5	The fear of imprisonment	3.10	3.10	4.00	1.12	0.00	4.00	0.38				X	
E6	The amount of the fines imposed for a conviction	3.04	3.00	4.00	1.03	0.00	4.00	0.47				X	
E7	The possibility of liquidation after a corporate manslaughter conviction	3.08	3.04	4.00	1.09	0.00	4.00	0.41				X	
E8	The risk of being disqualified from holding a position in the organisation	2.76	3.00	4.00	1.21	0.00	4.00	0.27				X	
E9	The reputation of the organisation	3.26	4.00	4.00	0.96	0.00	4.00	0.54				X	
E10	Reduction in premiums	2.58	3.00	3.00	1.09	0.00	4.00	0.41				X	
E11	Morality	3.03	3.00	4.00	1.08	0.00	4.00	0.42				X	
	Overall	**3.01**	**3.30**	**4.00**	**1.05**	**0.00**	**4.00**	-					

Notes: *Mean reatings are based on a 5-point scale (0- No influence, 1- Minor influence, 2- Some influence, 3- Moderate influence, 4- Vast influence). **rWG indices are based on a uniform null distribution. Based on 5,000 simulation runs, rWG values of 0.11, 0.15 and 0.20 are the 90%, 95% and 99% confidence interval estimates respectively for a group size of 96 and a 5-point scale. Hence rWG values > 0.20 are evidence of significant agreement at p < 0.01.

This indicates that there is significant agreement amongst the participants as to the degree of the identified prosecutions, convictions and further factors to influence the way SMEs perform in H&S. The mean ratings are therefore credible representations of the respondents' assessments and can be interpreted with confidence.

In order to ensure conformity with the scale so as to help in the interpretation of the results, the mean ratings are rounded to the nearest point on the 5-point scale for the overall assessment. This assessment shows that all the identified factors are generally perceived as having a *moderate* influence on the way SMEs manage H&S.

6.7.2 Discussion

The overall assessment of the factors with potential to influence H&S performance, given by Table 6-18, confirms that the consequences of a poor H&S performance might have a notable influence in the way SMEs manage health and safety. The issue of improvement/prohibition notices, for instance, is perceived by the participants to have a *'moderate'* influence. This result could be attributed to the fact that the issue of prohibition notices could cause delays in a project and in effect, bring financial repercussions to SMEs that could affect severely their profits.

The assessment of these factors gives indication that the risk of prosecution after a H&S breach has also an impact in the management of health and safety. Participants agreed that the 550+ cases prosecuted by the HSE every year have a *'moderate'* influence on how SMEs manage H&S. This is considering that 95% of these cases result in a conviction (HSE, 2017a). A similar degree of influence was obtained for the risk of being prosecuted for the offence of corporate manslaughter or as an individual for any other offence related to health and safety.

Regarding the consequences of being convicted for a H&S offence, participants indicated that they all have a *'moderate'* influence on how SMEs manage H&S. Considering the severity of the fines to be imposed and the possibility of going to prison, it is unsurprising to find that these factors are enhancing a H&S good practice. In this case, fines for a H&S breach are calculated based on the company turnover to have a real economic impact in the organisation. In addition, the risk of being disqualified from holding a position in an organisation also resulted with a lower score among these, but still within the range of the *'moderate' level* of the scale. A plausible reason for this is that respondents who were not directors might under-estimate the risk of being disqualified for a H&S offence. The findings confirm that the punishments for noncompliance with safety regulations sends a clear message to organisations that they need to take their health and safety obligations seriously.

Furthermore, an interesting finding of this study is that the identified indirect consequences of being convicted for a H&S offence have a part in the way health and safety is currently being managed. The possibility of liquidation after a corporate manslaughter conviction, for instance, which could be a consequence of receiving high fines was considered to have a *'moderate'* influence. In fact, research by Perez, Ndekugri and Ankrah (2017) suggests that more than half of construction organisations found guilty for corporate manslaughter ceased trading shortly after the conviction. This can be linked to the fact that few organisations have financial reserves up to the fines imposed by the legislation or a significant reduction in market opportunities. It is the case of Cotswold Geotechnical Holdings, a construction business which was dissolved after being sentences to a fine which represented nearly 250 percent of its turnover (Ndekugri, 2013).

Fines are not the only factor causing financial loss in organisations for convicted companies, the reputation is also at risk. The safety records of organisations are one of the main factors taken into consideration in the contractor selection process (Huang and Hinze, 2003; Watt, Kayis and Willey, 2010), implying that the prospects of securing work are significantly diminished by health and safety convictions. Thus, it is reasonable to find from the analysis of this study that the reputation of organisations has a *'moderate'* influence in health and safety management.

Regarding the reduction of insurance premiums, it was unexpected to find that this resulted with the lowest mean score across the section. Although it is considered with a 'moderate' level of influence, the fact that it was the lowest rated could imply that a group of SMEs disagree with the common believe that a good standard of health and safety in the workplace could lower insurance premiums. Lastly, it is satisfying to observe that SMEs attempt to maintain a robust system of health and safety management because it is the right thing to do. The assessment on Table 6-18 shows that moral reasons have a *'moderate'* degree to influence H&S management in SMEs.

6.8 Influence of the CMCHA in H&S Management in Construction SMEs: QF1 - QF19

6.8.1 Results

Section F and last part of the survey intended to assess the extent to which identified H&S management factors have improved among SMEs since the Corporate Manslaughter and Corporate Homicide Act 2007 (CMCHA) came into force. The summary of the assessment is shown in. For each of the management factors the respondents indicated the degree of improvement among SMEs since the introduction of CMCHA. The response options were presented in a 5-item scale ranging from 0 (not improved) to 4 (vastly improved). In this case, the assessment of the mean ratings indicates that the management of risks in the workplace has the greatest level of improvement among the given factors with a mean rating of 2.60 (Std. Dev. 1.21). Reductions in premiums are perceived as having the lowest level of improvement since the CMCHA came into force with a mean rating of 1.21 (Std. Dev. = 1.19).

Considering the apparent variability in the aggregated rating (i.e. mean), the median and the mode (shown in Table 6-19), it is strictly necessary to evidence agreement amongst the participants. The calculation of the interrater agreement index for individual items (rWG) aids to interpret the aggregated measure (i.e. mean ratings) with much more confidence. The calculated rWG values for each of the factors are also indicated in Table 6-19. Unlike the previous sections, not all the H&S management factors assessed exceed the value of 0.20, which is the rWG threshold value for significant agreement at $p < 0.01$ for a group size of 96 and 5 item scale. The assessment shows that a total of five (5) of these factors resulted in significant agreement at $p < 0.05$ and a sole factor at $p > 0.10$.

Table 6-19. Descriptive statistics and inter-rater agreement indices of the level of improvement of H&S management since the Corporate Manslaughter and Corporate Homicide Act (QF1 - QF19).

	Influence of the Corporate Manslaughter Legislation	*Mean	Median	Mode	StdDev	Min	Max	rWG	Level of improvement since the Corporate Manslaughter and Corporate Homicide Act				
									None (0)	Minor (1)	Some (2)	Moderate (3)	Vast (4)
F1	The management of risks in the workplace	2.60	3.00	3.00	1.21	0.00	4.00	0.25				X	
F2	The rate of incidents in the organisation	2.22	2.00	3.00	1.27	0.00	4.00	0.16			X		
F3	Communication between employer and employees	2.31	2.00	3.00	1.23	0.00	4.00	0.20			X		
F4	The quality of the contents of H&S training	2.51	3.00	3.00	1.21	0.00	4.00	0.22				X	
F5	The provision of adequate working facilities	2.36	3.00	3.00	1.20	0.00	4.00	0.23			X		
F6	Compliance with legal requirements	2.57	3.00	3.00	1.15	0.00	4.00	0.30				X	
F7	Involvement of employees in decision making	1.88	2.00	2.00	1.25	0.00	4.00	0.19			X		
F8	Level of expertise on H&S	2.42	3.00	3.00	1.23	0.00	4.00	0.21			X		
F9	Provision of adequate tools and equipment	2.24	2.12	3.00	1.20	0.00	4.00	0.23			X		
F10	The budget allocated for H&S	2.01	2.00	3.00	1.24	0.00	4.00	0.23			X		
F11	Quality of site inspections	2.26	3.00	3.00	1.23	0.00	4.00	0.18			X		
F12	Reporting of accidents, incidents or near misses	2.33	3.00	3.00	1.32	0.00	4.00	0.08			X		
F13	Commitment to prevention on ill health	2.12	2.00	3.00	1.26	0.00	4.00	0.18			X		
F14	The level of formality of a H&S plan in the organisation	2.35	2.17	3.00	1.21	0.00	4.00	0.24			X		
F15	Working days lost due to absence of workers	1.62	1.31	1.00	1.27	0.00	4.00	0.21			X		
F16	Insurance premiums	1.21	1.00	0.00	1.19	0.00	4.00	0.32		X			
F17	The understanding of H&S risks within the organisation	2.36	2.68	3.00	1.24	0.00	4.00	0.17			X		
F18	Employer's behavior towards H&S	2.29	2.00	3.00	1.22	0.00	4.00	0.26			X		
F19	Morale and pride in working for the organisation	2.02	2.00	1.00	1.26	0.00	4.00	0.21			X		
	Overall	**2.19**	**2.33**	**3.00**	**1.23**	**0.00**	**4.00**	-					

Notes: *Mean reatings are based on a 5-point scale (0- No improvement, 1- Minor improvement, 2- Some improvement, 3- Moderate improvement, 4- Vast improvement).
**rWG indices are based on a uniform null distribution. Based on 5,000 simulation runs, rWG values of 0.11, 0.15 and 0.20 are the 90%, 95% and 99% confidence interval estimates respectively for a group size of 96 and a 5-point scale. Hence rWG values > 0.20 are evidence of significant agreement at p < 0.01.

The remainder of the factors show significant agreement at $p < 0.01$. In other words, these results are an indication that agreement among respondents cannot be interpreted at the same level of confidence across the assessed factors.

This study followed the recommendation of Dunlap, Burke and Smith-Crowe (2003) of estimating a 95% confidence interval for the interrater agreement index for individual items. Any values outside of this range is considered in no significant agreement amongst the participants. From the assessment on, it can be inferred that there is no significant agreement among participants on rating the level of improvement of *reporting accidents, incidents or near* misses since the CMCHA came into force in 2008. The remainder of the factors computed over a 95% confidence interval, meaning that they credible representations of the respondents' assessments and can be interpreted with confidence.

In order to ensure conformity with the scale so as to help in the interpretation of the results, the mean ratings are rounded to the nearest point on the 5-point scale for the overall assessment. The overall assessment indicated by Table 6-19 shows that the H&S management factors are generally perceived to have shown from *minor* to *moderate* improvement since the introduction of CMCHA. The management of risk in the workplace, the quality of H&S training and compliance with legal requirements are generally perceived to have shown *moderate* improvement. With the exception of insurance premiums which is generally perceived to have *minor* improvement, all the other H&S management factors are generally perceived to have shown *some* improvement since the CMCHA came into force.

6.8.2 Discussion

Considering that the successful prosecutions under the CMCHA represent a very small proportion of the number of fatalities reported by the HSE (Perez, Ndekugri and Ankrah, 2017), it was unexpected to find that some H&S management factors have improved in SMEs since the Act came into force. The overall assessment of the influence of the corporate manslaughter legislation, given by Table 6-19 indicates that this Act has made *'some'* improvement in health and safety among SMEs.

As previously explained (Section 6.8.1), the mean rating of most of the assessed factors can be interpreted with a 99% confidence interval (CI) and others with a 95%. Among the first, the management of risks in the workplace and compliance with legal requirements resulted with a *'moderate'* level of improvement since the CMCHA came into force. Participants also perceived a *'moderate'* improvement in the quality of the contents of H&S training. When assessing the other factors, communication between the employer and employees resulted with *'some'* improvement in the given scale. Meanwhile, the provision of adequate working facilities and the provision of adequate tools and equipment, a similar result was obtained. Although there is not statistical evidence, it is presumed that the improvement of these elements could be linked to the level of awareness of employers regarding their obligations to their employees discussed in Section 6.6.2.

Participants also indicated that the level of expertise on H&S and the employer's behaviour towards H&S has shown *'some'* improvement since the corporate manslaughter Act came into force in 2008. It is thus reasonable to believe that the simple and accessible support that institutions provide to guide SMEs on legal compliance are enhancing competency in the construction industry. The HSE for instance, have published the INDG417 which addresses the actions for directors, board members and business owners of organisations of all sizes to meet the health and safety legal obligations, including the ones associated to the corporate manslaughter offence.

With a 99% CI, the results give indications that the budget allocated for H&S in SMEs also showed *'some'* improvement. This is an indication that SMEs are taking into consideration the widely argued statement that money spent on safety is money well invested and could show returns in profitability (Arewa and Farrell, 2012). However, it is acknowledged that this is not always the case. Arewa (2014) argued on his thesis that some construction SMEs have no specific budget for a safety system and therefore are restricted in establishing a safe environment. This is the reason why, according to Arewa (2014), some companies statistically calculate that accidents will not occur and think they will 'get away with it'.

With a similar level of improvement and a 99% CI, the level of formality of a H&S plan in SMEs has been marked by the enactment of this act. This result could be one of the factors that triggered an improvement in the working days lost due to the absence of workers also observed in this assessment (Table 6-19). Regarding the satisfaction of employees, there was *'some'* improvement in their morale and pride in working for their organisations.

Considering that reductions in premiums resulted with the lowest mean score in the analysis discussed in section 6.7, it is unsurprising to observe that the cost of insurance premiums is perceived to have minor improvements since the enactment of CMCHA. The consistency of these results gives indication that even though organisations are improving their H&S management structure, insurance premiums do not seem to be reduced as it is commonly expected.

Among the factors with a 95% CI, it was observed that the rate of incidents in SMEs has shown '*some*' improvement. This is consistent with the statistics published by the HSE (2015) in which it is evident to notice a downtrend in the average rate of workplace injuries in the last decade. The involvement of employees in decision making was also one of the factors which is perceived to have '*somewhat*' improved in the management of health and safety. Regarding the quality of site inspections and commitment to prevention on ill health, the results show some level of improvement. Within the same confidence interval, the understanding of H&S risks within SMEs also resulted with '*some*' in the given scale of improvement. The assessment also showed that there was no agreement among the respondents on whether the reporting of accidents, incidents or near misses have improved since the CMCHA came into force.

6.9 Summary

This chapter sought to assess the level of implementation of a H&S management system in UK construction SMEs which represents the first part of the quantitative analysis of this research. Descriptive statistics were used to provide a picture of the participants of the questionnaire survey. In addition, inter-rater agreement tests were carried in order to interpret the mean score with confidence.

Based on the judgment of a sample of SMEs, it was found that they are currently implementing, albeit to a certain level, the tasks that comprise a Plan-Do-Check-Act occupational health and safety management system (OHSMS). These tasks were individually analysed and groups into the different stages of the cycle. Amongst the actions which are being implemented in the 'Plan' stage are: developing a H&S policy, ensuring compliance with the law, considering H&S in pre-plan and pre-design stages and generating H&S plans for the works to be carried out. A lower score was obtained within the same stage for seeking a fair balance between H&S, time, cost and quality. Amongst the ''Do stage are: carrying out risk assessments, training, involving workers and seeking external H&S advice were also being implemented. When assessing the 'Check' stage, the study found out that SMEs carry out site inspections, reporting incidents and carrying out periodic audits. Consistent with the literature, the assessment also revealed that the monitoring of ill-cases resulted with the lowest score amongst all tasks, negatively affecting the overall score of the 'Check' stage. Lastly, the 'Act' stage indicated that SMEs ensure lessons learned are considered for further improvements in their H&S performance. Also, the overall assessment enabled comparison among the different stages revealing a lack of continuity along the implementation of the system. This gives the indication that there is considerable room for SMEs to improve the way they manage H&S.

The agreement tests also evidenced that construction SMEs are generally aware of their main legal obligations as employers to their employees and other persons other than employees. Amongst these duties, having an employer's liability certificate resulted with the highest score in the 5-point scale. Other assessed duties were: providing training and safety equipment free of cost to employees; explaining to employees how risks are being controlled and who are responsible for the identified risks and providing toilets, washing facilities and first aid.

Furthermore, this chapter assessed the degree of influence of H&S prosecutions, convictions and further factors on the way SMEs manage health and safety. The analysis showed that all these factors have a 'moderate' influence which indicates that prosecutions is a successful method in enhancing H&S performance. Among the assessed factors are: the issue of improvement and prohibition notices; the risk of being prosecuted as an individual or for corporate manslaughter; the fear of imprisonment; the amount of fines imposed for a conviction; reputation and morality. With a lower score, reduction in premiums and past cases of prosecutions and convictions also resulted with a 'moderate' influence on the way SMEs manage H&S.

When looking at the influence of the Corporate Manslaughter and Corporate Homicide Act 2007 (CMCHA) in H&S management, the overall assessment indicated that the Act has made 'some' improvements among SMEs which represents the 3rd point in the 5-points scale of improvement. Amongst these elements are: rate of incidents, communication, involvement of employees, level of expertise, budget allocated for H&S, quality of site inspections and commitment to prevention on ill health. It was also indicated that the improvement has been 'moderate' in some other aspects of H&S management. These were: management of risks in the workplace, the quality of H&S training and compliance with legal requirement. Moreover, it was indicated that there was no agreement between the participants on whether the reporting of accidents, incidents or near misses have improved. Lastly, the findings suggest that the cost insurance premiums have slightly improved.

The variables assessed on this chapter achieved the third and fourth objective of this research. Complete achievement of the quantitative phase requires the consideration of the fifth objective which is to design, discuss and develop a model of relationship between these variables. The following chapter presents the findings of the statistical tests used to achieve this objective.

Chapter 7: Quantitative Data Analysis: Models of Relation Between Variables

7.1 Introduction

The previous chapter presented the first part of the quantitative phase of this research. This chapter completes the quantitative approach and addressed the fifth objective by designing, discussing and developing a model of relation between the variables assessed in the questionnaire survey. The first section presents the results of the statistical analysis used to test the correlation between the responses of the participants. The intention is to determine if any of the variables are correlated. As a second approach. significant correlations are then considered for regression analysis which aims to evaluate whether the variables can be predicted. Lastly, further statistical tests are carried out to determine whether the demographic characteristics of the participants influenced the responses provided. The evaluation of these relationships would help to have a better understanding of construction SMEs in the UK regarding health and safety management.

7.2 Correlation Between the Variables

One of the objectives of this study was to design, discuss and develop a model of relationship between the variables assessed in the questionnaire survey. These variables are: (i) level of implementation of an occupational H&S management system in construction SMEs (VAR1); (ii) level of awareness of employers' H&S duties of care to their employees and persons other than employees (VAR2); (iii) influence of factors related to H&S prosecutions and convictions in the management of H&S and further factors (VAR3); and (iv) degree of improvement of H&S management factors since the enactment of the CMCHA (VAR4). The listed variables were organised and entered into SPSS v24 for correlation analysis. Bivariate correlations among the variables are given by Table 7-1.

Table 7-1. Pearson's correlation matrix

Variables	(VAR1)	(VAR2)	(VAR3)	(VAR4)
Level of implementation of an occupational H&S management system in construction SMEs (VAR1)	1.000	.686*	.440*	.584*
Level of awareness of employers' H&S duties of care to their employees and persons other than employees (VAR2)	.686*	1.000	.483*	.454*
Influence of factors related to H&S prosecutions and convictions in the management of H&S and further factors (VAR3)	.440*	.483*	1.000	.654*
Degree of improvement of H&S management factors since the enactment of the CMCHA (VAR4)	.584*	.454*	.654*	1.000

* Correlation is significant at the 0.01 level (1-tailed)

The correlation matrix indicates that there is significant correlation among all the variables. For instance, level of implementation of an occupational H&S management system in construction SMEs (VAR1) is significantly and positively related to the influence of factors related to H&S prosecutions and convictions in the management of H&S and further factors (VAR3) *($r = 0.440$, $p < 0.01$)*. This is considered a low to moderate correlation according to Hinkle, Jurs and Wiersma (2009). Also, level of implementation of an occupational H&S management system in construction SMEs (VAR1) showed a significant and positive moderate correlation against the degree of improvement of H&S management factors since the enactment of the CMCHA (VAR4) *($r = 0.584$, $p < 0.01$)*. The relationship of the level of implementation of an occupational H&S management system in construction SMEs (VAR1) was also statistically significant and positive when compared to the level of awareness of employers' H&S duties of care to their employees and persons other than employees (VAR2) *($r = 0.686$, $p < 0.01$),* showing a moderate to high correlation. The correlation between the level of awareness of employers' H&S duties of care to their employees and persons other than employees (VAR2) and the influence of factors related to H&S prosecutions and convictions in the management of H&S and further factors (VAR3) was statistically significant and positive *($r = 0.483$, $p < 0.01$)* with a low to moderate size of correlation. The results were similar when the variable (VAR2) was tested against the degree of improvement of H&S management factors since the enactment of the CMCHA (VAR4) *($r = 0.454$, $p < 0.01$)*. Lastly, the influence of factors related to H&S prosecutions and convictions in the management of H&S and further factors (VAR3) showed a moderate to high correlation when compared to degree of improvement of H&S management factors since the enactment of the CMCHA (VAR4) *($r = 0.654$, $p < 0.01$)*.

Although the correlation coefficients of these associations give indication of an existing relationship between the variables, not all of these provide a meaningful contribution to this study. Therefore, this study analyses the findings which the researcher considered relevant for this study. These are presented below.

7.3 The Influence of the Level of Awareness of Employers’ H&S Duties of Care to Employees on the Level of Implementation of an Occupational Health and Safety Management System (OHSMS)

7.3.1 Correlation

From the results given by Table 7-1, it is perceived that the level of implementation of an occupational H&S management system in construction SMEs (VAR1) is significantly and positively related to level of awareness of employers’ H&S duties of care to their employees and persons other than employees (VAR2) ($r = 0.686$, $p < 0.01$). This means that higher the awareness of employers of the duties of care to employees and people other than employees is associated with higher implementation of a health and safety management system. Whilst this relationship is not evidence of causality (Field, 2017), the plot of the data points (

Figure 7-1) may be indicative of underlying linear causal relationship and such require further exploration. It can therefore be inferred from the results that there is sufficient evidence to proceed with the regression analysis to test the above relationship.

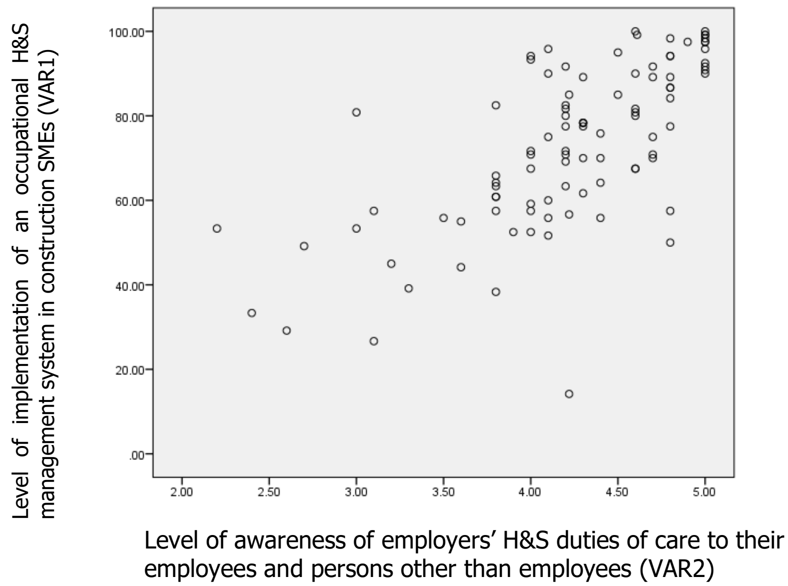

Figure 7-1. Plot of relationship between the of employers' H&S duties of care to their employees and persons other than employees on the level of implementation of an Occupational Health and Safety Management System (OHSMS).

7.3.2 Regression

Following the results of the correlation analysis of section 7.3.1, the hypothesis addressed in this section posits that the level of implementation of an occupational health and safety management system in SMEs will be positively and significantly related to the level of awareness of employers' duties of care to employees and other people other than employees. To test this statement, regression analysis was applied with the level of awareness of employers' duties of care to employees and other people other than employees (VAR2) as the independent variable, and the level of implementation of an occupational H&S management system in construction SMEs (VAR1) as the dependent variable. The output of the regression analysis is given in Table 7-2. From these results, the value on R^2 for the model generated is .470, implying than level of awareness of employers' duties of care to their employees and other people other than employees accounts for 47% of the variation on the level of implementation of an occupational health and safety management system in SMEs. The analysis of variance (ANOVA) which tests whether or not the model is a useful predictor, gives a highly significant result ($F = 83.494$, $p < 0.001$), indicating that this model has a predictive capability. Also, the t-test for the ß-value of level of awareness of employers' duties of care ($t = 9.138$, $p < 0.001$) is strong evidence that level of awareness of employers' duties of care to their employees significantly predicts the level of implementation of an occupational health and safety management system in SMEs.

Table 7-2. Regression analysis for the influence of the level of awareness of employers' duties of care to their employees and persons other than employees on the level of implementation of an OHSMS in SMEs

R	0.686	R^2	0.470	Adjusted R^2	0.465		
Std. Error	13.9962			Durbin-Watson	1.902		
Analysis of Variance (ANOVA)	df	Sum of Squares	Mean Square	F	Sig.		
Regression	1	16356.038	16356.038	83.494	.000		
Residual	94	18414.079	195.894				
Total	95	34770.117					
Variables in Equation	B	Std. Error	Beta	t	Sig.	Tolerance	VIF
Constant	-16.767	9.939		-1.687	0.095		
Level of awareness of duties of care	21.274	2.328	0.686	9.138	0.000	1.000	1.000

The ß-value (ß = .686) being positive is an indication of a positive relationship. Should the model be used for prediction, this value tells the extent to which the level of awareness of employers' duties of care to employees affects the level of implementation of an occupational health and safety management system in SMEs. However, the focus of the hypothesis test is to verify and explain relationship. An analysis of residuals was also undertaken to test the assumptions taken for the regression analysis. Plots of the residuals are shown in Figure 7-2, Figure 7-3 and Figure 7-4.

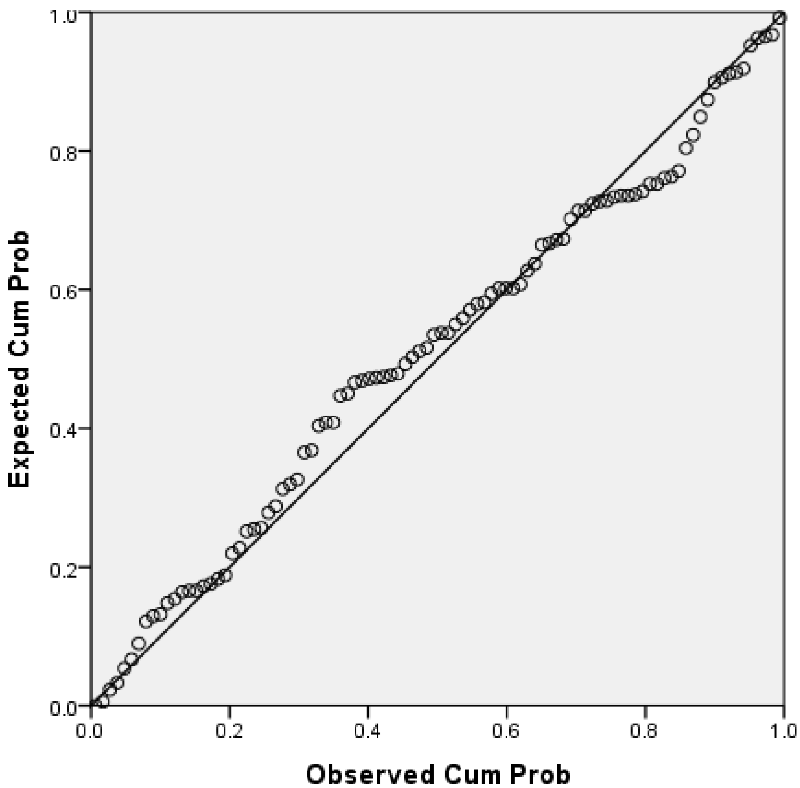

Figure 7-2. Normal P-P plot of standardised residuals

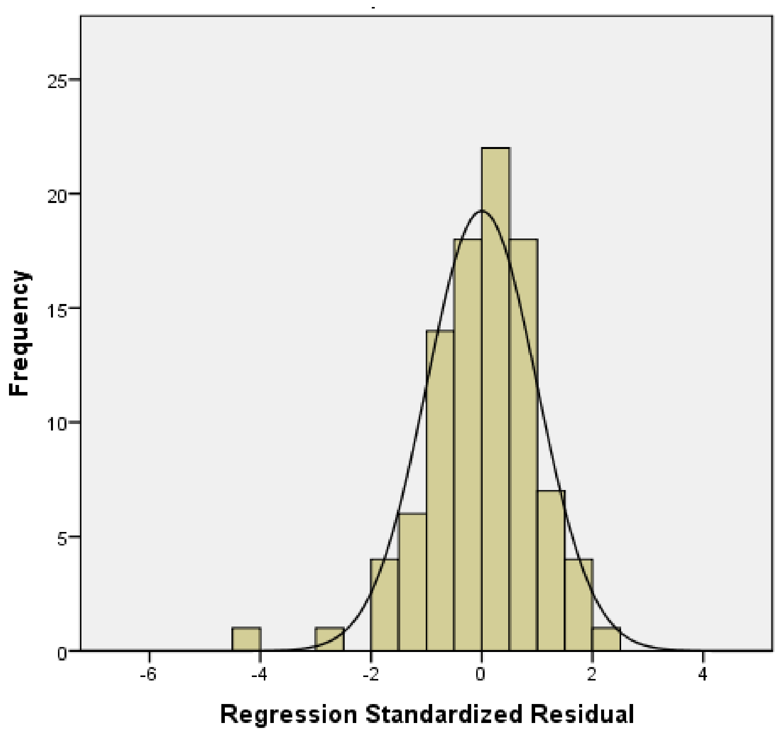

Figure 7-3. Histogram of standardised residuals

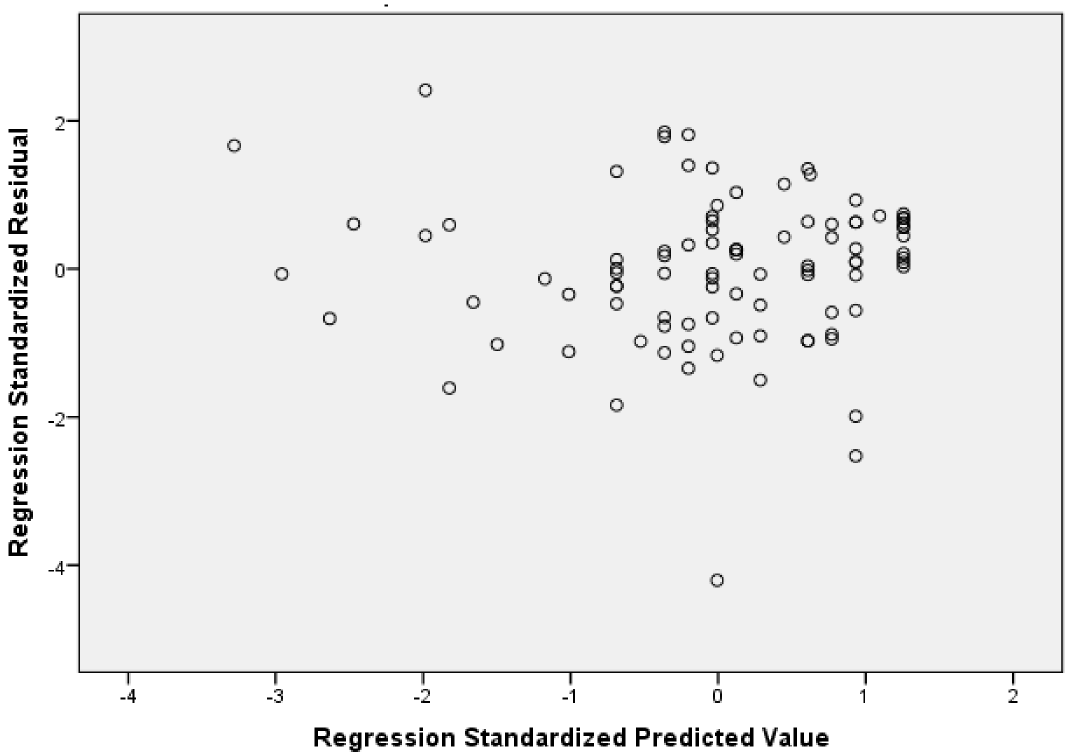

Figure 7-4. Scatter plot of standardised residuals

Figure 7-2 shows that the points follow the normality line and Figure 7-3 also shows a bell-shaped distribution. These indicate that the assumption of normality has not been violated. Homoscedasticity is tested by examining Figure 7-4. The random distribution of data points is an indication that this assumption has also not been violated. To test the autocorrelation of the regression model, the Durbin-Watson statistics was obtained (as given in Table 7-2). Its value of 1.902 is between 1 and 3 indicating that this assumption has also not been violated.

Taken together, the results thus support the statement that, *the level of implementation of an occupational health and safety management system in SMEs will be positively and significantly related to the level of awareness of employers' duties of care to employees and people other than employees.* The final regression equation can be presented as:

<u>LEVEL OF IMPLEMENTATION OF AN OCCUPATIONAL H&S MANAGEMENT SYSTEM IN CONSTRUCTION SMES (VAR1) = −16.77 + 21.27 LEVEL OF AWARENESS EMPLOYERS DUTIES OF CARE TO EMPLOYEES (VAR2)</u>

7.4 The Influence of the Size of an Organisation in the Management of Health and Safety

Across the construction industry, it is commonly believed that the size of an organisation plays an important role in the structure and performance of health and safety management. Studies have revealed that larger organisations tend to have a better health and safety management structure and, in effect, a better performance when compared to smaller companies (Arewa, 2014; Papworth, 2015). It was thus expected to find that that the results of the quantitative analysis of this study were related to the demographic characteristics of the respondents. Taking this into consideration, one of the objectives of this study was to investigate any model of relation between the results of the different sections of the questionnaire and the demographic information of the respondents and highlight any significant results.

A surprising finding is that after completing Kruskal-Wallis and Mann-Whitney tests, there was no significant evidence that the size of organisations that participated in the survey, based on annual turnover and number of employees, had an effect in the level of implementation of an occupational health and safety management system. The results were also not significant ($p > 0.05$) when assessing the relationship between the different sections of the questionnaire and the job title, years of experience managing H&S, type of construction organisation, main area of work, years in operation of the organisation or the region of work (see Appendix G). However, the tests indicated that there was significant difference between the level of awareness of employers' duties of care to employees and people other than employees by the different size of organisations.

7.4.1 Size based on the turnover

In order to evaluate the differences of the responses between the different types of organisations, the variables assessed in the questionnaire survey were once again organised and entered into SPSS v24. On this occasion, a non-parametric analysis was also carried out.

Table 7-3. Kruskal-Wallis Test for the level of awareness of employers' duties of care to their employees and persons other than employees based on the turnover of the organisations

Kruskal-Wallis H Test	Freq	Mean Rank	df	Chi-Square	Sig.
£632k or less	11	31.09	3	10.307	.016
£633k - £10.2m	53	48.04			
£10.3m - £36m	27	59.52	Monte Carlo Sig.		
Over £36m	5	32.20	99% CI	Lower	Upper
Total	96			.011	.017

A Kruskal-Wallis H test (Table 7-3) showed that there was a statistically significant difference in the level awareness of employers of the duties of care to employees and people other than employees between the different sizes of the organisations based on the turnover ($\chi 2(3) = 10.307$, $p = 0.016$). The fact that the boundaries of the confidence interval (.011 and .017) does not cross .05 gives confidence that the significant effect is genuine. As shown in Table 7-3, the variable of *turnover* was grouped into four different categories for the survey: organisations with (i) £632k or less; (ii) £633k to £10.2m; (iii)£10.3m to 36m and (iv) over £36m of annual turnover.

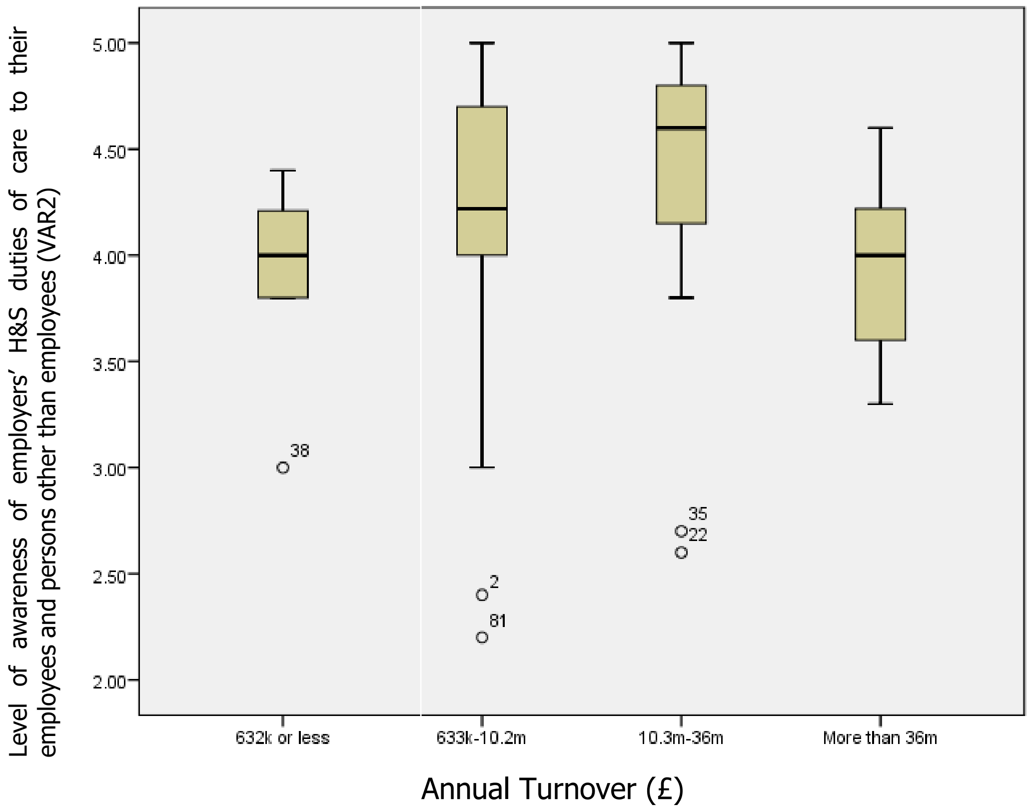

Figure 7-5. Boxplot for the level of awareness of employers' H&S duties of care to their employees and persons other than employees (VAR2) of organisations of different size based on turnover

One way to see which groups differ is to look at a boxplot of the groups (see Figure 7-5). One thing to note is that the medians of the first two types of organisations (*micro* and *small*) are very much alike in term of the assessed score. However, the median of *medium* organisations seems higher than the median for *micro* and *small* organisations. This might be an indication of where the difference identified in the Kruskal-Wallis test lies. Since the conclusions of the boxplot are subjective and the Kruskal-Wallis test is unable to tell where the differences lie among the groups, nonparametric post-hoc tests are imperative to test the differences among groups. For this exploration, Mann-Whitney U test for two groups was used. Using a Bonferroni correction to reduce the error rate of post hoc tests (Field, 2017), the critical value to test the significance will be .05 divided by the number of tests to be conducted. Since this study is focused on SMEs, tests will be carried out between *micro, small and medium* organisations based on the annual turnover. This results in three tests, meaning that the critical level of significance is now .0167.

Table 7-4. Mann-Whitney Test for the level of awareness of employers' duties of care to their employees and persons other than employees of micro and small organisations

Turnover	Freq	Mean Rank		
£632k or less (Micro)	11	22.95	Mann-Whitney U	186.500
£633k – £10.2m (Small)	53	34.48	Wilcoxon W	252.500
			Z	-1.874
Total	64		Asymp. Sig. (2-tailed)	.061

Table 7-5. Mann-Whitney Test for the level of awareness of employers' duties of care to their employees and persons other than employees of micro and medium organisations

Turnover	Freq	Mean Rank		
£632k or less (Micro)	11	14.14	Mann-Whitney U	89.500
£10.3 – £36m (Medium)	32	24.70	Wilcoxon W	155.500
			Z	-2.417
Total	43		Asymp. Sig. (2-tailed)	.016

Table 7-6. Mann-Whitney Test for the level of awareness of employers' duties of care to their employees and persons other than employees of small and medium organisations

Turnover	Freq	Mean Rank		
£633k – £10.2m (Small)	53	40.56	Mann-Whitney U	718.500
£10.3 – £36m (Medium)	32	47.05	Wilcoxon W	2149.500
			Z	-1.178
Total	85		Asymp. Sig. (2-tailed)	.239

The output of the analysis (see Table 7-4, Table 7-5 and Table 7-6) shows that *micro* against *small* resulted with a significance of .061 (2-tailed), *micro* against *medium* with a Asymp. Sig. (2-tailed) of .016 and *small* against *medium* with an Asymp. Sig. (2-tailed) of .239. Since the p value of *small* verses *medium* is quite high, it shows that there is no significant difference between the responses of these type of organisations. On the other hand, the p value of *micro* verses *small* is quite low. This means that there are slight differences between the level of awareness of the duties of care to employees and people other than employees between these two groups however, the difference is not so large to be considered significant. From the results of the final test, the p value of *micro* organisations against *medium* organisations of .016 indicates that the difference of the mean rank between these two groups is considered significant.

By comparing the mean ranks and the significance results, it can be stated that, among SMEs, *micro* organisations are less aware of the duties of care owed to employees and people other than employees when compared to the *medium* organisations in the construction industry.

Following recommendations by Field (2017) and Morgan (2013), the effect size was also calculated to provide an objective measure of the importance of the effect of this relationship. Table 7-7 provides the calculation of the coefficient *r* for the relationship of the differences between the level of awareness of the duties of care to employees and people other than employees between *micro* and *medium* organisations. According to Cohen (1988), a coefficient value of *-.37* represents a medium to large effect.

Table 7-7. Effect size calculation for the comparison between micro and medium organisations

Effect Size Calculation	
Z	-2.417
N	43
r	-.37

7.5 Discussion

The results of the tests presented provide empirical evidence that the level of implementation of an occupational H&S management system of an organisation is influenced not only by financial factors as it is widely argued. While other studies focus on whether organisations provide PPE or invest in H&S training for their employees, this study suggests that the level of implementation of a H&S management system in construction SMEs is directly linked to the level of awareness of the employers' duties of care owed to their employees and people other than employees. The analysis implies that greater level of awareness of the owners or directing mind of these organisations yields a greater level of implementation of a H&S management system. Since it has been claimed that SMEs do not possess sufficient motivation and therefore lack of commitment to carry out health and safety improvements (Arocena and Núñez, 2010), the findings suggest that one of the challenges of the industry to enhance the H&S performance is to promote a positive culture among SMEs owners or directors by raising awareness of the health and safety obligations owed to their employees.

It would appear that there is a wide range of opportunities to support the health and safety needs of SMEs to increase awareness. It was previously discussed in Chapter 3 that the HSE, acting as the enforcing authority, have developed a series of documents particularly designed for SMEs in which simple definitions and instructions are given on how to manage health and safety. For example, the industry guidance INDG 417, INDG 275 and INDG 449. However, the unceasing involvement of construction SMEs in accidents occurrence makes clear that these mechanisms fall short of the effectiveness that they may achieve. There are different views on the reasons for these failures, but it is clear that several basic steps may be undertaken to provide the best chance of getting the safety and health message across. For instance, Toone (2005) identified back then that many SMEs find the tone and language adopted in much of the supporting documents inappropriate to their everyday experience and needs, although practical and accessible guidance is becoming more widely available. Furthermore, a study sponsored by the HSE (HSE, 2007) stressed that it is also important to study the information on the organisational readiness to change. It is hoped that by adopting appropriate and user-focused measures, the potential for improving the awareness of health and safety duties of care in SMEs may be more effectively realised and, in effect, an improvement in health and safety performance.

It is important to highlight that the results of this chapter are presented as a generalisation of SMEs. However, considering that the management approach of health and safety may vary depending on the type of construction SMEs, more investigation is needed in order to develop inclusive improvement measures. In support of this argument, the results show that *micro* organisations are less aware of the duties of care owed to employees and people other than employees when compared to the *medium* organisations in the construction industry. Since the size of an organisation is partly based on the turnover, the findings confirm that health and safety management is strongly linked to the financial situation of the organisation. It is therefore reasonable to understand why large organisations are less likely to have accidents when compared to smaller businesses (Kheni, Dainty and Gibb, 2005; Arocena and Núñez, 2010).

7.6 Summary

This chapter sought to explore the potential relationships between the variables assessed in the questionnaire survey. These variables are: (i) level of implementation of an occupational H&S management system in construction SMEs (VAR1); (ii) level of awareness of employers' H&S duties of care to their employees and persons other than employees (VAR2); (iii) influence of factors related to H&S prosecutions and convictions in the management of H&S and further factors (VAR3); and (iv) degree of improvement of H&S management factors since the enactment of the CMCHA (VAR4). Pearson's correlation analysis and stepwise regression were carried out for this purpose. Also, the demographic characteristics of the participants were associated with these variables in order to identify any descriptive factor of an SMEs that could influence the way they manage H&S in the UK construction industry.

After carrying out the analysis, it was found that the higher the level of awareness of employers' duties of care to employees and people other than employees is associated with higher implementation of a health and safety management system. With a predictive capability, the regression model indicated that the level of awareness of employers' duties of care to their employees and other people than employees accounts for 47% of the variation on the level of implementation of an occupational health and safety management system in SMEs. The results also provided significant evidence that the size of an organisation (i.e. turnover) influences the management of H&S in SMEs. The findings suggest that micro organisations are less aware of their duties of care owed to employees and people other than employees when compared to medium organisations in the construction industry. This is an indication that the financial status of an organisation is strongly linked to the management of health and safety.

This chapter has thus addressed the fifth objective of this research which intended to design, discuss and develop a model of relation between the different variables assessed. Having established these relationships, the next phase of this research addresses the qualitative approach of the explanatory mixed methods. The next chapter presents the analysis of the interviews which will validate the quantitative findings and help to have a better understanding of how health and safety is currently being managed in construction SMEs.

Chapter 8: Qualitative Data Analysis: Results and Findings

8.1 Introduction

The previous chapters discussed the results and findings of the quantitative approach which comprised the initial phase of the research strategy adopted in this study. The research opted for complementing these findings by collecting and analysing qualitative data, enabling an in-depth examination of the management of health and safety in UK construction SMEs. This chapter therefore addresses the second phase of the research strategy by presenting the results and findings of the qualitative inquiry. First, a brief description of the data collection process is presented along with a description of the participants. Subsequently, the key findings regarding H&S management in construction SMEs are addressed. Finally, the perception of the participants regarding the influence of the CMCHA in the way they manage H&S is discussed.

8.2 Interviews

As described in the methodology chapter, organisations from the questionnaire survey who expressed interest in elaborating on the responses provided were contacted for the second phase of the data collection and analysis of this study. Five of these participants agreed to take part of telephone interviews. Participants comprised experienced practitioners who represented UK construction of different sizes. The demographic information of the participants is provided in Table 8-1.

Table 8-1. Demographic information of the participants of the interviews.

Participant	Role in Organisation	H&S Experience	Region	Type Work	Type SME
P1	Director/Owner	+10 years	England	Specialist	Small
P2	H&S Manager	+10 years	England	Specialist	Medium
P3	H&S Manager	+10 years	England	General Contractor	Medium
P4	Director/Owner	+10 years	England	Specialist	Small
P5	H&S Manager	+10 years	England	Specialist	Medium

The average duration of these interviews was approximately 40 minutes. These were voice recorded and later manually transcribed for analysis. A detailed description of the content of the interview schedule developed to guide the interviews is presented in Section 5.3.3.2. The guide has been annexed in Appendix I.

8.3 General Overview of the Data Analysis Strategy

Following a blend of steps as suggested by Creswell (2014) and presented in Section 5.3.3.4, the interviews conducted were first transcribed using computer software and manual means. Attempts were made to ensure that information and descriptions which could be used to identify interviews were anonymised. This was followed by reading through the data which allowed a general sense of the information gathered. As the data was considered manageable, manual colour coding was carried out to generate a description of the setting as well as categories for analysis. Concepts of the coding in this study were organised into appropriate themes in line with the analysis guide. A total of five themes were finally generated. These are 'Perceptions of the management of health and safety in SMEs', 'Challenges in SMEs H&S management', 'Further H&S improvements in construction SMEs', 'Factors enhancing a good H&S performance in SMEs' and 'The influence of the CMCHA in H&S management'. A detailed analysis of these themes is presented in the following subsections.

8.4 Results and Findings of the Qualitative Analysis

Following the design structure of the analysis for the qualitative approach, the data was manually coded which enabled the examination of themes related to the management of health and safety in construction SMEs and the influence of the legislation in their health and safety practice. The key findings of the analysis are summarised in the headings below.

8.4.1 Perception of the management of health and safety in SMEs

One of the objectives of the quantitative analysis was to obtain a number which would measure the management of health and safety in SMEs as posed in Objective 4 of this research (see Section 6.5). It was however necessary to interpret the context of this number. The qualitative inquiry was thus used to further explore this matter and provide non-numerical data. Participants of the interviews were asked to express their perception of how SMEs are managing H&S in the construction industry. Overall, they indicated that SMEs are doing fairly well in improving their approach into safety management. One of the participants stated:

> *"On the whole, I think it is improving. It is an improving picture. Small and medium organisations are investing more time in managing health and safety and that is reflected in the statistics." [SME Director]*

Furthermore, it was stated that compliant SMEs actually go beyond the requirements if they have the resources available.

> *"…some SMEs even try to take one step ahead from where they need to be…" [H&S Manager]*

However, they also highlighted that there are cases where SMEs struggle to maintain a good safety performance. Consistent with the literature and part of the findings of the quantitative analysis, they indicated that performance depends on the size of the organisation and the way H&S is managed. In regard to the influence of the size, one of the participants added:

> *"…There is spectrum of understanding from very good to very poor. The smaller you are, the less understanding and the less commitment there is and less investment. The bigger the better. Primarily because the bigger you become the more responsibilities you have." [H&S Manager]*

This meant that participants were in broad agreement that large organisation tend to have better commitment to health and safety and a lower accidents rate when compared to smaller companies. This is consistent with views of Kheni, Dainty and Gibb (2008) and Arocena and Núñez (2010). The findings suggest that clients play an important role in how much effort organisations put into managing health and safety. Clients have responsibility of selecting health and safety compliant contractors to deliver projects, which is why they tend to appoint large contractors. This is demonstrated in the following extract from one of the interviews.

"If you are a bigger company, the expectation from the client is that they will have the benefit and security that bigger companies have better systems in place. Whereas, in smaller companies, the client has to bolster the areas where they are not good at. In the end, you get what you pay for." [H&S Manager]

Regarding the implementation of a structured organisational health and safety management system (OHSMS), the analysis indicated that most SMEs organise a system to manage H&S in line with the standards. Surprisingly, participants stated that some SMEs are accredited to OSHAS 18001 which is a system regularly audited and in constant development. Also, requirements are of high standards when they work as subcontractors. Principal contractors are required under the CDM Regulations to demonstrate that their supply chain is competent to do the work. Therefore, some SMEs are asked to complete a pre-qualification questionnaire where they must prove that they implement the tasks of an OHSMS. Commenting on this, one of the interviewees for instance emphasized that:

"Basically, it depends who you work for. If you work for a large and renowned organisation, you will be asked to provide evidence of how you are managing health and safety. But when you are doing small work, there are many ways to get away with it." [SME Director]

8.4.2 Challenges in SMEs H&S management

Attempting to identify influential factors to compare with the existing literature, participants were asked to identify the current challenges that SMEs face when managing health and safety in construction projects. The analysis of the responses revealed a list factors hindering a better H&S performance in SMEs. These challenges are illustrated in Figure 8-1 and discussed in this subsection. In addition, Table 8-2 provides the number of participants addressing each challenge expressed in percentage along with the frequency rank. A similar concept of frequency percentage is used across the other sections of this chapter.

Table 8-2. Challenges in SMEs H&S Management

Challenges	Participant Frequency Percentage	Rank
Cost	100%	1
Lack of training	80%	2
Competitive market	60%	3
Lack of HSE support	40%	4
Time pressure	40%	4
Non-Standardised Requirements	20%	6

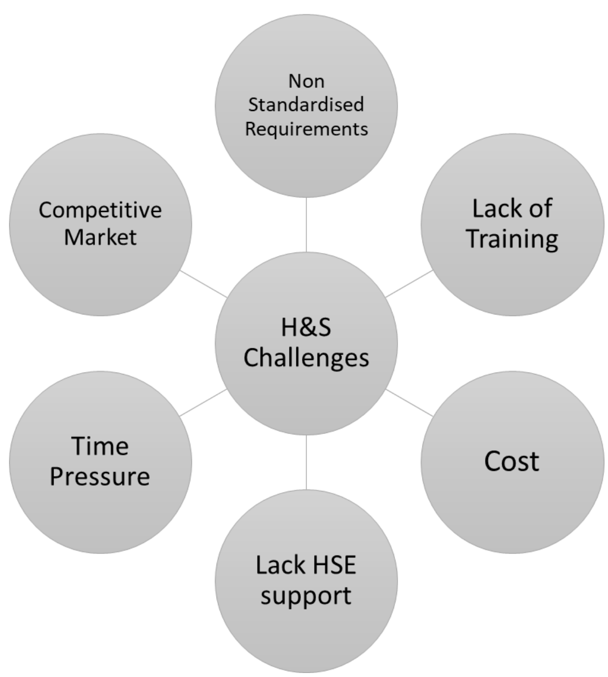

Figure 8-1. H&S challenges in SMEs

As widely discussed in the literature, the cost of compliance with health and safety regulations or the investment in developing a management system can be prohibitive. Clearly, this is a limitation for SMEs who lack of sufficient resources to make them proactive in safety management. In regard to this, one of the interviewees commented:

> *"...safety can look expensive, despite the value it has. Quite often, SMEs are reacting to the requirements… they are not in a place where they can be proactive." [SME Director]*

The high cost of health and safety is also linked to the competitive market in the industry. The findings indicate that profit margins are also an important factor to consider when making H&S decisions in SMEs. In part, this can be attributable to clients and quantity surveyors who should consider health and safety in their supply chain before pricing the works. In fact, quantity surveyors are not explicitly named in the CDM Regulations 2015 as duty holders. This goes in line with the study carried out by Manu (2012), who argued that quantity surveyors are less conscious of their responsibility to promote H&S.

Another factor associated with costs is that the safety requirements on site are not standardised what makes every project to be different in terms of the safety measures to adopt. The following abstract from the interviews presents the experience of one of the participants regarding the use of Personal Protective Equipment (PPE):

> *"Three years ago, one of the contractors required workers to wear yellow high-vests and another one wanted them orange." [SME Director]*

However, cost is not the only element influencing the safety performance of SMEs. From Figure 8-1, it can be also seen that lack of training is currently an issue for this type of industry. This is demonstrated in the following quotations:

> *"I don't think there is enough training in health and safety for the people on the ground. People are learning things when they are asked to do things. In this case, supervisors need to do a hard work to support workers." [SME Director]*

> *"Training is a big issue because some of the recognised training schemes are benchmarks… I don't think there is a lot of health and safety input into the training courses people attend to. Particularly, apprenticeships…" [H&S Manager]*

An interesting finding was that interviewees believe it would be beneficial for the industry if the authorities set a training certification body which would provide relevant knowledge and accreditation for those who deliver training courses. However, this would require significant changes in the current approach of the authorities. Participants also indicated that the HSE is not very supportive when SMEs are trying to get advice and guidance from their local inspectors.

It was also acknowledged that project programmes are very strict regarding delivery time. This then puts a time pressure on SMEs to deliver the works what directly affects the time these organisations spend managing safety in the workplace. Unrealistic time scales were previously identified by Manu (2012) as one of the construction project features associated to H&S issues. Addressing this challenge, the latest Construction Design and

Management Regulations 2015 requires that the client must allocate sufficient time to allow contractors assess health and safety issues and plan their works.

Arewa (2014) also attempted to identify SMEs limitations to attainment of safety best practice in the UK construction industry. In line with some of the findings of this research, his study highlighted mostly financial themes such as: cost of providing equipment, poor negotiation skills and competition. Table 8-2 illustrates the summary of analysis regarding the different H&S management challenges in SMEs identified by the participants.

8.4.3 Further H&S improvements in construction SMEs

In addition to identifying the current challenges, the qualitative approach planned to collect recommendations for improvements directly from SMEs. Participants were asked to identify or give some examples of the main aspects of H&S to be improved within construction SMEs. The findings of the analysis indicated that their responses were focused on three different aspects: competency, fairness and guidance. These key elements are presented in Table 8-3 along with some comments extracted from the interviews.

Table 8-3. Further improvements in construction SMEs

Improvements	Participant Frequency Percentage	Comments
Competency	60%	*- "Since SMEs usually carry out small works, they do not go through the necessary training to manage H&s properly"* *- "CSCS cards play an important role in competency. Unfortunately, they are not always a mandatory requirement in construction sites"*
Fairness	40%	*-"it is far easier to comply with everything if you make money"* *- "Everybody says there is no price for health and safety but unfortunately, there is a massive price for health and safety. Not many people to go to and they are prepared to pay a bit more"*
Guidance	80%	*- "The HSE should have more advisory capacity. Local inspectors are not interested in giving advices. They are only focused on prosecutions and fees for interventions (FFI). The HSE used to be a body that you could go to as a contractor and go straight to see the inspector".* *- "Authorities should put more effort in assisting SMEs. Not for them to take responsibility for it obviously but for some professional advice to be available"* *- "There is currently a confusion about the role of the HSE, is it to advice on health and safety or is it to enforce the legislation?"*

Competence has been labelled by the HSE as one of the most important components in workplace activities. Despite efforts of the CDM Regulations 2015 in ensuring that organisations involved in a construction project are capable enough to carry out the works in a safely manner, some interviewees were of the view that some SMEs are failing to evidence that their employees have appropriate training, skills, experience and knowledge.

The analysis also indicated that the role of the authorities in promoting health and safety best practice is currently being questioned by small and medium enterprises. Some participants indicated that the HSE used to be a supporting institution with vast resources to help organisations to comply with safety regulations. However, the government decision to cut the HSE budget by 35% in 2016, plus a 12% over the years, imposed a legal duty to the HSE to recover its costs. This meant that rather than assuming a supportive role and providing guidance, the HSE must spend most of its time on securing compliance. One of the immediate measures was to close down its free helpline, which accumulated over 750,000 calls per annum from small businesses according to a renowned H&S consultant. This shift of approach has raised a concern among practitioners on whether inspectors are now encouraged by the government to charge companies under the fee for intervention (FFI) scheme. According to *Health and Safety at Work* magazine, the invoices issued to construction organisations under this scheme had increased 40% in a three years span since it was introduced. It is thus unsurprising to perceive dissatisfaction from SMEs regarding the support of the government in promoting a good safety culture.

One of the interviewees shared the following comment regarding this issue:

> *"I used to be able to build a relationship with my whichever local HSE Inspector I was working with. When I started projects, I would approach them and say: hello, you'll see an F10 on your desk. This is who we are and what we're doing. Come down and have a look and let's go through it so that you're happy with what we're doing, and you can give us any point if you think we're doing anything wrong. You can't do that anymore. They're just not interested." [SME Director]*

However, one of the participants made the following clarification:

> *"The HSE is a great organisation but I believe it is not their responsibility. It is my responsibility that my workforce and my staff go home every day and assure they will turn up in the morning. That responsibility lies in the employer. I am 100% certain of that." [SME Director]*

It is therefore a matter of understanding what type of support can be received from the authorities. This research did not assume a position regarding this issue as the participation of the HSE is required to build on the discussion.

8.4.4 Factors enhancing a good H&S performance in SMEs

The literature suggests that there are different factors that enhance good H&S performance in SMEs. The influence of each of these factors was measured in the quantitative part of the research. However, the analysis could not indicate which of the factors has the most influence on the way SMEs are currently managing health and safety. It was thus the intention of the qualitative analysis to take a step further and ask SMEs to identify what drives them to maintain a workplace safe.

Considering the continuous development of the UK legal system, the introduction of the new Sentencing Guidelines 2016 for instance, it has become a common practice in the construction industry to relate H&S to the potential consequences to an organisation when they are prosecuted for H&S offences. Among these, it was expected that financial punishments and reputational damage could have the greatest impact in construction

SMEs. The findings suggest that SMEs disagree with the idea that punishment is the most adequate approach to promote a positive H&S culture.

Surprisingly, although aware of the other factors, the interviewees were in the views that morality and the wellbeing of their employees is what drives them to improve their safety performance. This is an aspect of occupational health and safety that have remained an understudied area. Some of the comments of the participants regarding morality are highlighted below:

> *"…nobody employs anybody to hurt them. Apart from showing knowledge and respect for the law and legislation, there is a moral factor. I do believe that employers make sure they know what to do to keep their employees safe." [H&S Manager]*
>
> *"I think a lot of companies do as much as they certainly can do to make sure everybody goes home safely. I think it is more the moral aspect than the potential punishment they can get." [SME Director]*
>
> *"I think the thing that affects companies the most is when the things go wrong, and people get affected. Forget the financial side of it, companies hear about fines all the time and that has not improved the performance. But I think things really improve when something goes wrong unfortunately, and someone gets hurt." [SME Director]*
>
> *"SMEs do this because it is the right thing to do. We need to adopt a more positive approach." [SME Director]*

"Sometimes it is better to say: listen this is a better approach instead of forcing a business to educate the staff or improving the controls." [H&S Manager]

In addition to the above, participants also identified other factors that drive small and medium organisations to enhance the management of health and safety. A summary of these is presented in Table 8-4.

Table 8-4. Factors drive SMEs to manage H&S properly.

Drivers	Participant Frequency Percentage	Rank
Morality	80%	1
Reputation	60%	2
Punitive measures	60%	2
Loyalty to long term clients	40%	4
Previous accidents	20%	5

8.4.5 The influence of the CMCHA in H&S management

Regarding the establishment of the Corporate Manslaughter and Corporate Homicide Act (CMCHA) in the UK legal framework, findings from the quantitative inquiry presented in Section 6.8 suggest that it has not made a significant contribution in H&S management since it came into force in 2008. In the interviews, participants were in complete agreement that this Act has not been as effective as it was thought it would be in prosecuting organisations. They highlighted that the Act has been built in a way it can be very difficult for prosecutors to consider the offence of corporate manslaughter in the workplace. This is evidenced with the following quotations:

"In reality, nothing changed. You could be charged with corporate manslaughter before this Act. There is very little difference." [H&S Manager]

"…it is because to be prosecuted for this offence it has to be very neglectful and unlawful. In my experience I've seen cases where people have died because of a very bad fault of the company and still they were not prosecuted for corporate manslaughter." [SME Director]

"I think it sort of gives the perception that if a company is not performing correctly and something major happens at the senior management level there are now more chances of being prosecuted. But in my opinion, this is just a perception." [H&S Manager]

"we all know the Act is there, but I wouldn't even put it on the radar of a risk in our business." [SME Director]

To support their argument, the interviewees referred to the number prosecutions and convictions since the enactment of the act, which is relatively small when compared to the fatalities occurring in the workplace every year. Furthermore, they also highlighted that cases for corporate manslaughter only involve small and medium organisations. The findings then suggest that prosecuting large organisations has remained a challenge for prosecutors. A critical review of these cases has been published as part of this research in Perez, Ndekugri and Ankrah (2017). Regarding the size of the organisations being convicted under this act, one of the participants commented:

"I've yet to see a director or senior manager or a major construction company being prosecuted and going to prison for a serious incident… You can send as many

> *small businessmen to prison for six months as you like. Nobody cares." [SME Director]*

Commenting on the liability of large organisations when accidents occur, another participant added:

> *"It'll always fall on somebody lower down the line or subcontractor SME. Until the managing director for… (names of large UK construction firms) …or whoever gets prosecuted there'll be no real change in senior management attitude towards H&S." [SME Director]*

The interviews also revealed how the new Sentencing Guidelines 2016 for health and safety offences could deter the main features of the CMCHA. Since the publication of this guidelines, a simple breach of the Health and Safety at Work Act for instance could result in similar punishments (e.g. fines) than for being prosecuted for corporate manslaughter. This then puts into question the feasibility of going through the difficult route of the corporate manslaughter legislation.

8.5 Contrast Between Quantitative-Qualitative Findings

The research design of this study considered the implementation of a qualitative inquiry as a second approach aiming to investigate in further details the findings of the quantitative findings and provide additional findings concerning the level of implementation of a H&S management system in SMEs, factors influencing the way they manage SMEs and the impact of the CMCHA in the construction industry. In addition, it was expected that a qualitative approach would also provide clarification on some unexpected aspects of the quantitative results.

When looking at H&S performance, both quantitative and qualitative analysis indicate agreement that SMEs are currently performing well in the management of H&S. The interviews however did not provide details on the different tasks constituting an occupational health and safety management system as addressed in the quantitative survey. Remarkably, these findings are consistent with the results presented by Arewa (2014) when studied UK construction SMEs. Yet, both approaches also indicated that there is considerable room for improvement in terms of commitment to a better health and safety culture. In response, the qualitative findings identified the main challenges experienced by SMEs that hinder an improvement in their safety performance. These were non-standardised requirements, lack of training, cost of H&S, competitive construction market, time pressure and lack of support from authorities.

Another similarity between the methods was that H&S performance among SMEs depend on the size and turnover of the organisation. For instance, the quantitative analysis evidenced significant difference in the level of awareness of the employers' duties of care to their employees and persons other than employees between medium and micro organisations (see Section 7.4). This level of awareness was also found to be a good predictor of the level of implementation of a H&S management system based on the regression analysis presented in Section 7.3. Similarly, the analysis of the interviews showed that the bigger the organisation the more resources they allocate for training, which reportedly is the most suitable approach to raise awareness of H&S responsibilities within an organisation.

Interestingly, some notable differences were found when analysing the factor that drive SMEs to manage H&S properly. The quantitative findings were consistent with the literature and evidenced that the implications of being prosecuted for a H&S offence such as reputation, fines, imprisonment and disqualification have *'moderate'* influence. However, the qualitative findings showed that managing health and safety positively is a matter of morality and caring for the life of the employees rather than any other factor. As discussed in the analysis, this reveals a novel area in the management of health and safety that must be studied further.

It was unexpected to find in the quantitative analysis that improvements in the health and safety performance of an SME do not necessary reduce the cost of insurance premiums. As a justification, some interviewees indicated that the cost of insurance premiums are strongly attached to the growth of a business more than to the H&S performance. For instance, the cost of insurance premiums increases as an organisation is constantly growing, making difficult to measure the influence of the H&S performance. Although official statistics are absent, the interviews also indicated that the amount and cost of insurance claims have drastically increased, directly increasing the cost of premiums for an organisation.

Findings from the quantitative and qualitative analysis were also consistent regarding the influence of the CMCHA. The quantitative analysis indicated that "*some*" improvement, which represented the middle point of the measurement scale, can be perceived in the way SMEs manage H&S since the enactment of this Act. In the same line of results, the qualitative analysis revealed that a significant change is yet to be seen from this Act in the H&S performance of the construction industry. In fact, interviewees suggested that a revision should take place since large organisations are not being punished.

8.6 Summary

In the pursuit of developing an in-depth examination of H&S management in construction SMEs, this qualitative inquiry was undertaken to support and complement the findings of the quantitative approach. This chapter presented the findings of the analysis of the interviews carried out with a selection of UK construction small and medium sized organisations. Consistent with the quantitative results, the findings of the qualitative analysis have emphasised that SMEs are currently managing H&S to an acceptable level. However, the analysis also indicated that there is room for improvement. The interviews identified the current SMEs challenges impacting the way they are managing H&S as: non-standardised requirements, lack of training, cost of H&S, competitive construction market, time pressure and lack of support from authorities. Regarding the main aspects to be improved in the construction industry, the qualitative analysis gave indication that guidance, fairness and competency are factors that would have immediate effect in the H&S performance of SMEs.

The qualitative analysis also revealed that amongst all the factors that drive SMEs to have a good H&S management, morality has become a main feature. This suggests that the influence of the cost of H&S and the legal implications for a H&S offence measured in the quantitative inquiry are considered by SMEs as secondary factors. This might be a justification why the quantitative and qualitative findings indicated that the enactment of the CMCHA has done very little in improving the way SMEs manage health and safety.

Overall, the views of the findings of the interviews show consistency with the quantitative inquiry in regard to the management of SMEs and the influence of the CMCHA in health and safety. This makes a stronger argument for the research problem and evidences validation of the research findings.

Chapter 9: Research Validation

9.1 Introduction

The last three chapters have presented the findings of the analysis carried out to achieve the aim and objectives of this research. This has provided an actual status of the management of health and safety in UK construction SMEs. The extent to which the findings can be trusted however relies on the process of validation undertaken to confirm (or disconfirm) the findings of the research. This chapter therefore addresses the steps undertaken to justify validity in respect of this research.

9.2 Process of Research Validation

Findings from a research study intend to provide insights and recommendations to influence a desired change or improvement in particular areas. Therefore, the validity of the research findings regarding a phenomenon of interest is of critical importance. Validity has been referred as to the degree to which measurement are indeed what the research set out to measure (Kerlinger and Lee, 2000). It differs in quantitative and qualitative research, but in both it serves the purpose of checking on the quality of the data and the results (Creswell and Plano Clark, 2011).

In terms of the qualitative inquiry, validity and reliability were ensured by applying multiple approaches as suggested by Butterfield et al. (2005), Creswell (2014) and Gibbs (2017). These considerations were presented in Section 5.3.3.5. In this chapter, the validation process discussed focuses mainly on the quantitative inquiry.

The subject of validity is complex and controversial on account of the different types of validity that exist (Kerlinger and Lee, 2000; Creswell, 2014). Amongst the different types, it is common to come across face (the degree to which a measure appears to be related to a specific construct), content (how judges assess whether the items are representative of possible items), criterion (whether the scores relate to some external standard), construct (whether the scores measure what they intend to measure), internal, statistical inference, and external validity (Reason, 1981; Babbie, 1990; Bagozzi, Yi and Phillips, 1991; Kerlinger and Lee, 2000; Fellows and Liu, 2015; Coulacoglou and Saklofske, 2017). Some of these validity measures were previously considered in the design of the quantitative inquiry. For instance, face and content validation were considerations of the pilot study of the survey questionnaire. The validity assessments are addressed below.

9.3 Face Validity

Also called surface validity or appearance validity, face validity is defined by Holden (2010) as the degree to which an individual who is an expert on the research subject review the content of an instrument and its items as relevant to the context in which the test is being administered. This means that they are evaluating whether each of the measuring items matches any given conceptual domain of the concept. As explained by Kerlinger and Lee (2000), there is no quantification on this judgment or any index of agreement. It is thus considered a superficial measure of validity and many researchers do not consider this as an active measure of validity. It is used on this research on the basis that a measure should appear to measure what it measures.

The survey questionnaire designed for collecting the quantitative data for this research was pre-tested in a pilot study where participants did not suggest any changes on the content of the instrument provided. It was thus assumed that the procedure on the instrument appeared to be a valid measure of the variables to be assessed.

9.4 Content Validity

Content validity is referred to the extent to which the elements within a measurement procedure are relevant and representative of the construct that they will be used to measure (Haynes, Richard and Kubany, 1995). This type of validity is typically achieved by a rational analysis of the instrument by experts in the research subject. In the process of validation, items are analysed for readability, clarity and comprehensiveness. This validation approach is usually combined with face validity to increase validity strength of the research

Content validity for this study was also assessed by carrying out a pilot test of the survey questionnaire. Although the participants did not suggest any modifications to elements of the questionnaire, further analysis by the researcher identified that one of the sections did not capture the necessary information required to measure the construct of interest. To improve content validity, a total of 11 questions were added to the survey instrument.

9.5 Internal Validity

Internal validation addresses how cause-effect relationships are free from bias arising from, for example, research design. Although different sources emphasise on the importance of good research design for achieving good internal validity (Creswell and

Plano Clark, 2011; Fellows and Liu, 2015), they fall short of identifying appropriate procedures for checking whether indeed good internal validity has been achieved (Ankrah, 2007). The researcher has thus to subjectively examine the options and assume a line of action to demonstrate validity of his own work. Convergence of research findings with published research was the main approach adopted in this study to assess internal validity.

9.5.1 Convergence of research findings with published research

It is believed that the outcome of a single study by itself contributes little to the body of knowledge (Ankrah, 2007). Validity is achieved when the results of this study have been compared with other studies that examine the same problem (Brinberg and McGrath, 1988). This validation assessment has been used in other construction management studies (cf. Ankrah, 2007; Tuuli, 2009; Manu, 2012).

Convergence of the findings of this research is evident from the continual reference to the existing literature in the discussion sections of Chapters 6 and 7. Findings are found to be consistent with the literature which gives indication of adequate convergence. In relation to the qualitative inquiry, convergence with published research is also evident and shown in the findings section of the qualitative analysis (Chapter 8).

9.6 External Validity

External validity is the extent to which findings hold or generalise over variations in persons, settings, treatments, and outcomes (Fellows and Liu, 2015). According to Brinberg and McGrath, (1988), the essence of external validation is to gain confidence in the findings and what they mean. It is also argued that it is through this process that research information transforms into knowledge. There are three aspects of external validation: replication, convergence analysis and boundary search which are discussed below.

9.6.1 Replication

Replication involves determining whether the set of findings can be reproduced when the same pathway (experimental, theoretical or empirical), the same set of instruments, and research strategy are used again (Brinberg and McGrath, 1988; Rosenthal and Rosnow, 1991). Other sources describe this as the test of reliability of the research (Rosenthal and Rosnow, 1991; Kerlinger and Lee, 2000). In reality however, an exact replication of any research is impracticable as no two occasions are exactly the same (Brinberg and McGrath, 1988; Rosenthal and Rosnow, 1991). Therefore for this reason, in this research like many others (cf. Ankrah, 2007; Tuuli, 2009; Manu, 2012) direct replication was not considered. It must however be emphasised that the survey questionnaire was designed and piloted to ensure that the data collected was reliable. Moreover, Cronbach alpha was used to measure reliability of the data in the quantitative analysis specifically in Section 6.3.2.

9.6.2 Convergence analysis

The principle of convergence, also referred to as triangulation, is an important part of assessing the robustness of research (Brinberg and McGrath, 1988). According to Denzin (2009), convergence analysis is the use of different methodologies to study the same phenomenon. Convergence is achieved when there is evidence of agreement of substantive outcomes derived from the use of different and independent models, methods, and/or occasions (Brinberg and McGrath, 1988). In this research the use of an explanatory sequential mixed method to investigate the way H&S is currently managed by SMEs in the UK construction industry and the impact of the legal system, although to an extent, revealed convergence between the quantitative and qualitative findings. This is specifically addressed in Section 8.4.

9.6.3 Boundary Search

Boundary search is the attempt to identify the boundaries associated with the findings of a research (Brinberg and McGrath, 1988; Rosenthal and Rosnow, 1991). It is often established over time through replications and convergence analysis to deliberately search for the boundaries of findings (Brinberg and McGrath, 1988). Due to the time and cost constraints associated with completing a PhD, it was not possible for the external validation of this research to include boundary search. It is however important to emphasise that there are potential boundaries to the findings reported in this study, an example of which is the country of study.

9.7 Summary

This chapter has presented efforts to validate the findings of this research within the areas of face, content, internal and external validation. Face and content validity were assessed in the pilot testing of the survey questionnaire by analysing and judging the elements of the instrument. In the internal validation, convergence between research findings and published research was considered adequate based on the consistency of the results of this study with the existent literature. In the external validation, convergence between the quantitative and qualitative findings evidenced robustness of the research. In terms of the qualitative analysis, it was indicated that validity and reliability were previously assessed in Section 5.3.3.5. In the next chapter, the conclusions of the entire research are drawn. The limitations of the research and relevant recommendations are also put forward.

Chapter 10: Conclusions and Recommendations

10.1 Introduction

The management of health and safety (H&S) in SMEs has been a recurring theme within the construction industry. It is thus essential to investigate how these types of organisations implement the tasks that enhance good H&S practice. To this end, this research was undertaken to measure the level of implementation of a simple occupational health and safety management system (OHSMS) in UK construction SMEs and assess how it is influenced by the latest addition to the UK legal framework for H&S management, the Corporate Manslaughter and Corporate Homicide Act (CMCHA). This final chapter summarises the entire research and presents the main conclusions, contribution to knowledge and limitations of the study. Lastly, some recommendations for further research in relation to the management of H&S are also given.

10.2 Review of the Research Objectives

The introduction chapter (Chapter 1) of this thesis set out the aim of this research as to analyse the influence of the corporate manslaughter legislation on the management of health and safety by SMEs in the UK construction industry. This sought to answer three fundamental research questions:

- Do construction SMEs implement management systems to improve their health and safety performance?
- Are construction SMEs aware of their basic duties of care to their employees?

- To what extent does the offence of corporate manslaughter influence the way construction SMEs manage health and safety?

To help achieve the set aim and answer the posed questions, a number of objectives were put forward. A review of how these research objectives were achieved is outlined below.

Objective 1: *A critical examination of the literature to develop an understanding of the importance of health and safety in a work environment and the management and legal framework behind the procedures and practices applied in the UK.*

This first objective is addressed in Chapters 3 and 4. An in-depth review of H&S management literature was undertaken to provide an understanding of the role of management in preventing accidents in the construction working environment. The review revealed that modern management theories can be widely applied in the way H&S is managed in organisations of all sizes. For instance, the Plan-Do-Check-Act (PDCA) iterative process has become the base of the operation of standardised and non-standardised occupational health and safety management systems (OHSMS). The review established that the implementation of these systems is likely to reduce the rate of accidents, material damage, personal injuries, absenteeism of employees and improve the working conditions, productivity, sales and profit. However, it was demonstrated that implementation costs and lack of interest make implementing OHSMS challenging amongst SMEs (see Section 3.5.5). This has caused SMEs operating in the UK construction industry to account for a bulk of unsafe acts and consequently, become a main target for prosecuting actions. Unfortunately, research on the management of H&S is rather limited.

This shortcoming hinders understanding of the commitment of SMEs to implementing a safety culture and consequently undermines implementation of potential improvement measures.

In terms of improvement efforts, the UK government and its enforcing authority, the Health and Safety Executive (HSE), have followed the tradition of using the power of regulation to encourage positive health and safety performance. Amongst the different tools and developments of H&S legislation, the review highlighted a lack of application of one of the most recent additions, the Corporate Manslaughter and Corporate Homicide Act 2007 (CMCHA) (see Section 4.4). With fatality rates still being high, it is arguable that this legislation has achieved very little in incentivising effective health and safety management. In terms of its applicability, this part of the study evidenced that whilst the corporate manslaughter legislation was intended to make it easier to convict large companies for poor management of their activities, all the convictions after a decade of the legislation getting onto the statute book have so far been of SMEs (see Section 4.4.3) without actually impacting on the fatality rates significantly. This insight thus highlighted the question of the extent of its practical impact in the way SMEs are currently managing health and safety. This research question could only be answered through further systematic empirical research.

Objective 2: *Undertake a critical review of the structure of SMEs in the UK and their health and safety performance in the construction industry.*

The second objective, addressed in Chapter 2, required an understanding of the role of SMEs in the UK construction industry and its H&S performance. Despite the evidence of some improvement in its safety performance, the chapter revealed that the reduction of cases of non-fatal injuries, ill-health and fatalities in the workplace continues to be a challenge in the UK construction industry. The fragmentation caused by lack of integration among the supply chain members and the large number of SMEs involved in the construction sector make achieving H&S improvement challenging. By examining the statistics, the chapter also highlighted that SMEs account for the vast majority of incidents reported in the construction workplace. Notably, there is an apparent inverse relationship between business size and occupational accidents. Many authors attribute this to the way organisations manage health and safety from a senior level but limited research has been undertaken to investigate this further in order to highlight the actual deficiencies in practice. This shows that there is a gap in the knowledge on construction SMEs that needs to be explored.

Objective 3: *To determine the awareness of the health and safety duty of care owed by the directors or owners of construction SMEs to their employees, particularly the risk of prosecution under the Corporate Manslaughter and Corporate Homicide Act.*

This was addressed in Chapter 6. Given the importance of knowledge in the management of H&S in an organisation, a questionnaire was designed to measure the level of awareness of the health and safety duties of care owed by the top management level in SMEs. A mean score analysis and the implementation of an inter-rater agreement test determined that construction SMEs are generally aware of their main legal obligations as employers to their employees and other persons other than employees (see Section 6.6). Amongst all the duties assessed in this section of the questionnaire, having an employer's liability certificate resulted in the highest score on the given scale. Other assessed duties were: providing training and safety equipment free of charge to employees; explaining to employees how risks are being controlled and who are responsible for the identified risks; and providing toilets, washing facilities and first aid.

Regarding the risks and extent of exposure under the corporate manslaughter legislation, the survey findings showed that the potential consequences for breaching the H&S legislation have a '*moderate*' influence in enhancing H&S performance within construction SMEs (see Section 6.7). This is some indication that H&S prosecutions and convictions are successful approaches in achieving compliance with legal obligations. Among the assessed factors having a '*moderate*' influence were: the issue of improvement and prohibition notices; the risk of being prosecuted as an individual or for corporate manslaughter; the fear of imprisonment; the amount of fines imposed for a conviction; reputation and morality. With a lower score, reduction in insurance premiums and past cases of prosecutions and convictions also resulted in a 'moderate' influence on the way SMEs manage H&S.

Objective 4: *To investigate how construction SMEs are currently implementing occupational health and safety management systems at a senior level.*

This objective was addressed as part of Chapter 6 and Chapter 8. Based on the judgment of a sample of SMEs, the quantitative and qualitative analysis of this study evidenced agreement that SMEs are currently implementing, albeit not completely, the tasks that comprise a Plan-Do-Check-Act occupational health and safety management system (OHSMS) (see Section 6.5 and Section 8.4.1). These tasks were individually analysed and grouped into the different stages of the cycle during the quantitative phase of the research. Amongst the actions which are being implemented in the 'Plan' stage are: developing a H&S policy, ensuring compliance with the law, considering H&S in pre-plan and pre-design stages and generating H&S plans for the works to be carried out. A lower score was obtained within the same stage for seeking a fair balance between H&S, time, cost and quality. This thus provides evidence on current issues in project accomplishment among SMEs. Other tasks being implemented at the 'Do' stage actions are: carrying out risk assessments, training, involving workers and seeking external H&S advice. When assessing the 'Check' stage, the study found out that SMEs carry out site inspections, reporting incidents and carrying out periodic audits. Consistent with the literature, the assessment also revealed that the monitoring of ill-health cases resulted in the lowest score amongst all tasks, negatively affecting the overall score of the 'Check' stage. This gives indication of a current issue in the construction industry that needs urgent attention as workers in this sector are in high risk of developing cancer, lung diseases and physical health risks such as back injuries and upper limbs disorders. Lastly, the 'Act' stage indicated that SMEs ensure lessons learned are considered for further improvements in their H&S performance. Aggregating the results to produce an overall assessment for each of the four stages enabled comparison between the different stages revealing a lack of continuity along the implementation of the cycle with some decline (albeit marginal) in the degree of implementation from the 'Plan' stage through to 'Act' stage. This gives an indication that there is still considerable room for SMEs to improve the way they manage H&S. To this end, findings from the interviews identified that the main challenges experienced by SMEs that hinder an improvement in their safety performance are related to the lack of training, cost of H&S, non-standardised requirements, competitive construction market, time pressure and lack of support from authorities (See Section 8.4.2).

Objective 5: *To design, discuss and develop a model of relationship between variables assessed in the study regarding an effective safety culture.*

This objective was addressed in Chapter 7. This chapter presents the results of the statistical analysis used to test the correlation between the responses of the participants. The Pearson's correlation, Mann-Whitney and, Kruskal-Wallis tests and regression analysis were employed to explore and draw inferences about the relationships between the different variables assessed in the study and the demographic information of the participants. These variables were: (i) level of implementation of an occupational H&S management system in construction SMEs (VAR1); (ii) level of awareness of employers' H&S duties of care to their employees and persons other than employees (VAR2); (iii) influence of factors related to H&S prosecutions and convictions in the management of H&S and further factors (VAR3); and (iv) degree of improvement of H&S management factors since the enactment of the CMCHA (VAR4).

After carrying out the analysis, it was found that higher awareness of employers of their duties of care to employees and people other than employees is associated with "higher implementation of a health and safety management systems" (see Section 7.3.1). Moreover, further analysis provided evidence that a reliable regression model could be generated with very good capability to predict the level of implementation of a H&S management system based on the employers' level of awareness of their duties of care to their employees and persons other than employees (see Section 7.3.2). Findings from this chapter also provided significant evidence that the size of an organisation (i.e. turnover) influences the management of H&S in SMEs (see Section 7.4). The results suggested that micro organisations are less aware of their duties of care owed to employees and people other than employees when compared to medium organisations in the construction industry. This is an indication that the financial status of an organisation is strongly linked to the management of health and safety.

Objective 6: *To critically evaluate the on-going influence of the Corporate Manslaughter Act in the way construction SMEs manage health and safety in the workplace.*

This objective was addressed in the final part of Chapter 6 as well as in Chapter 8. Results from the inter-rater agreement test performed during the quantitative stage indicated that the Corporate Manslaughter and Corporate Homicide Act has made 'some' improvements in the way SMEs manage H&S (see Section 6.8). Amongst the assessed elements were: rate of incidents, communication, involvement of employees, level of expertise, budget allocated for H&S, quality of site inspections and commitment to prevention on ill health. In some other aspects of H&S management, the improvement has been identified as 'moderate'. These were: management of risks in the workplace, the quality of H&S training and compliance with legal requirement. Participants also indicated that the level of expertise on H&S and the employer's behaviour towards H&S have shown *'some'* improvement since the Corporate Manslaughter and Corporate Homicide Act came into force in 2008. It is thus reasonable to believe that the simple and accessible support that institutions provide to guide SMEs on legal compliance are enhancing competency in the construction industry. The improvements are affirmed by further findings that suggest that the cost of insurance premiums have also slightly improved. Unfortunately, the results also indicated that there was no agreement between the participants on whether the reporting of accidents, incidents or near misses have improved. Seeking for clarification, participants from the interviews were in complete agreement that this Act has not been as effective as it was thought it would be in prosecuting organisations (see Section 8.4.5). In this regard, the qualitative analysis revealed that the Act has been built in a way that it can be very difficult for prosecutors to consider the offence of corporate manslaughter in the workplace. In fact, interviewees suggested that a revision of this Act should take place since large organisations are not being punished.

10.3 Conclusions of the Research

Summarising the findings presented in the review of the objectives (see Section 10.2), the main conclusions drawn from the research are that:

- SMEs in the UK construction industry currently implement the structure of a health and safety management system based on a PDCA cycle. However, there is evidence of a lack of balance between the different stages of this cycle and none of the stages are being implemented fully.
- Employers, or SMEs in this case, are generally aware of their main legal obligations to their employees and other persons other than employees as established by the legislation. Specifically, they were more aware of their duty to have an employer's liability insurance certificate.
- The level of implementation of a health and safety management system in construction SMEs is influenced by the level of awareness of the employers' duties of care to their employees and persons other than employees.
- The size of an organisation influences the management of H&S in SMEs. Micro organisations were found to be less aware of their duties of care owed to their employees and persons other than employees compared to medium sized organisations in the construction industry, and this was associated with the extent of implementation of H&S management. This indicates that the financial status of an organisation impacts on their safety awareness and consequently their H&S management.

- The fear of potential consequences of breaching the H&S regulations such as fines, imprisonment, damage in reputation, liquidation and disqualification are successful drivers for enhancing H&S management amongst SMEs in the construction industry.
- The Corporate Manslaughter and Corporate Homicide Act has had *'some'* influence on the way SMEs manage H&S. However, SMEs perceive that significant change is yet to be seen from this Act in the H&S performance of the construction industry. Regardless of the enactment of this Act, it was highlighted that prosecuting large organisations for H&S offences remains a challenge.

In summary, these conclusions provide answers to the research questions and objectives posed to understand how SMEs are currently managing H&S in the UK construction industry and how they are influenced by the legal system. Although the introduction of the Corporate Manslaughter and Corporate Homicide Act has not caused a huge impact in the H&S performance of the construction industry, SMEs are aware of their H&S obligations as employers and that can be appreciated in the way they are currently managing their organisations. However, there is considerable room for improvements with regards to H&S training, allocation of resources, time spent in H&S, monitoring ill-health and involvement of the workforce in H&S matters.

10.4 Recommendations for Industry

This research has argued that health and safety is a very important aspect in construction management, not only for the well-being of the workforce but also for those who can be indirectly affected by the safety performance of a construction site. The insights presented in this study put forward a number of recommendations to provide some direction for improvement in the management of H&S in the construction industry. These are considered below:

1. To achieve better H&S outcomes, it is recommended that construction organisations allocate adequate resources to assess each of the tasks that comprise an effective H&S management system and how they currently apply them within their organisations. This could help them identify the weaknesses of their current implementation and consequently, develop strategies that could potentially improve their safety performance. For example, this research revealed that SMEs should put more attention into seeking a fair balance between H&S, time, cost and quality, as well as involving workers in H&S matters and monitoring ill-health.
2. Considering the high risk of prosecution for breaching H&S regulations, it is recommended that SMEs raise more awareness on the potential consequences of being convicted for a H&S offence. In practical terms, this means putting more effort into investigating current H&S legislation (e.g. CDM Regulations 2015 and Sentencing Guidelines), and past successful cases (e.g. fines, prison time, post-conviction status). This could provide a full understanding on the actions that could possibly lead to the dissolution of a construction firm.
3. Based on the findings of this study, it is recommended that SMEs put effort in raising their awareness on their duties of care, as it has been evidenced that this could enhance the way they manage H&S. In practical terms, this would mean devoting more effort into orientating, training and motivating the senior

management level regarding their H&S obligation towards the employees and the workforce.

4. With regards of the Corporate Manslaughter and Corporate Homicide Act 2007, it is recommended that SMEs express their views on the existing issues within this legislation. Results from this study indicated that organisations have made significant H&S improvements, but probably not through the knowledge of this Act. This could lead to authorities to review the current legal system and make further improvements.

In summary, awareness matters. For construction organisations to improve their H&S performance, it is necessary to raise the awareness of their duties of care for their employees in the chair and management level of the organisation. This goes in hand with the commitment of the organisation to orientate and motivate their senior level to understand and implement an effective H&S management system. Moreover, it is important to understand the current H&S legislation and the possible consequences of being convicted for a H&S offence. This can be achieved by studying current legislation and past cases, allocating adequate resources (e.g. time, cost) for the management of H&S, and continuous monitoring of their H&S implementation.

10.5 Contribution to Knowledge

This research has provided new insight into the management of health and safety in small and medium organisations (SMEs) in the construction industry, revealing how they are currently implementing health and safety management systems and how current legislation influences the implementation of a good health and safety practice, in particular the Corporate Manslaughter and Corporate Homicide Act.

Regarding the management of health and safety, this study has made significant contribution by evidencing that overall, SMEs are currently carrying out the tasks that comprise the structure of a management system. This however does not indicate that these types of organisations are implementing them effectively. This research also provided contributions on the different actions implemented by SMEs on each of the stages of the Plan-Do-Check-Act cycle. Moreover, the overall assessment unveiled a lack of continuity along the implementation of the system, which suggests that there is considerable room for improvement in the way SMEs manage H&S.

This study also made a contribution by providing a tangible measure of the level of awareness of employers' legal duties to their employees and persons other than employees. This measurement revealed that SMEs directors or employees in the senior management level have a good understanding of their legal obligations towards the safety of their employees and persons other than employees. Another significant contribution was that the potential consequences of being prosecuted for health and safety offences, such as fines, imprisonment, reputation and disqualification are indeed factors with high impact in enhancing the implementation of a good H&S practice amongst SMEs.

The study has also provided empirical evidence that the level of implementation of an occupational health and safety management system in construction SMEs is influenced by the level of awareness of the employers' duties of care to their employees and persons other than employees. If a causal relationship can be established, this can be used as a basis for enhancing the safety performance in construction organisations. In addition, this study has provided confirmation that the financial status of SMEs is linked to the management of health and safety.

In relation to the Corporate Manslaughter and Corporate Homicide Act (CMCHA), the contribution of this study is that this Act has led to some improvements in the way SMEs manage H&S. However, the findings also suggest that the Act has made little impact on the impediments against the prosecution of large organisations for corporate manslaughter.

Overall, considering the fact that small and medium organisations represent the vast majority of the construction supply chain in the UK, this research provides insights that could potentially lead towards achieving a safer construction industry.

10.6 Research Limitations

As acknowledged by this study, health and safety is a complex and controversial area when it refers to the way it is managed in the workplace. It was thus expected that the sample of SMEs participating in this research would not give a truthful answer if the questionnaire was to evaluate their own organisations. To this end, the study refers to their perception of SMEs as a whole and takes the assumption that when participants are judging the industry, they are actually judging their own company. This is based on the assumption that their judgment must be based on their own experiences in their private companies. Thus, if the respondents failed to answer the questions as envisaged, then the generalisation of the results may not be true reflection of the population. However, the methodology undertaken was designed to help obviate the potential biases.

Although the different 5-point scales used for assessing the different variables of the questionnaire survey have been previously used in construction management research and have also been applied in similar health and safety studies, it may be that the scales were not wide enough in capturing subtle differences in the way H&S is being managed in UK construction industry. This may have partly accounted for the similarity of results in some of the tasks addressed.

Another limitation is that despite the focus of this research being the UK, the majority of SMEs participating on this research were actually from England. It is thus entirely plausible that there may be significant differences in the findings if this study is replicated in another jurisdiction. Indeed, this aspect is recommended as a potential area for further research.

The limitations noted in this section do not however undermine the validity of this research and its main findings. The convergence between the quantitative and qualitative findings gives credence to the results presented. Moreover, as mentioned by Ankrah (2007) in his work, scientific research is a never-ending quest which requires continuous measurement and examination of associations.

10.7 Recommendations for Future Research

Based on the findings and limitations of the research that have been noted, the following recommendations for future research have been identified:

1. As noted in section 9.6, the majority of the participants of this study represented the England region of the UK. Considering that the Corporate Manslaughter and Corporate Homicide Act also applies across Wales, Scotland and Northern Ireland, it is entirely plausible that there may be significant differences in the findings if this study is replicated in these other regions of the UK. It would be interesting to identify if differences do exist for benchmarking purposes. It is therefore recommended that similar studies are carried out in the different countries that constitute the United Kingdom for comparative analysis.
2. Since this study does not measure the effectiveness of the Occupational Health and Safety Management Systems implemented by SMEs, it is recommended that additional research is carried out to understand how the elements of these systems are being applied. This could benefit the industry by identifying new challenges which could be hindering SMEs from good health and safety management practices. Moreover, it can be useful to identify the plausible reasons for the lack of continuity along the PDCA cycle revealed in the findings of this research.
3. Given the need to effectively disseminate and share knowledge, the results of this research can be incorporated in a conceptual management toolkit, possibly web-based, that could possibly assist SMEs or even large organisation to self-assess or conduct a 'health check' on the structure of their H&S management

system. This would provide a tangible measurement of their health and safety practice and could be used for supply chain benchmarking.

4. The findings revealed that there is significant association between the level of awareness of the H&S regulations and the way SMEs manage H&S in the construction workplace. However, this research did not establish a causal effect. To further validate this association, future research from a bigger sample is recommended so that firmer conclusions can be drawn.
5. An interesting finding in this research was the evidence that morality and the wellbeing of employees is one of the main factors that drives SMEs to improve their safety performance. This is an aspect of occupational health and safety that has remained an understudied area. It would be interesting if this area becomes a main topic of study in future health and safety management research in the construction industry.
6. To complement the assessment of the level of awareness of employers of their duties of care to their employees and persons other than employees, it is important that studies considering other classifications of duties are carried out. For instance, an evaluation of the awareness of the duties of care outlined in the Construction Design and Management Regulations 2015 would allow a wider judgment of the awareness of organisations of their legal obligations.
7. During the timeframe of this research, new Sentencing Guidelines was introduced in the UK legal framework which allows the Health and Safety at Work Act to achieve similar conviction outcomes when compared to the

Corporate Manslaughter and Corporate Homicide Act. Given that the severity of a conviction is one of the main features of the latter, it is therefore recommended to further analyse how this new addition will influence the prosecutions routes following a fatality in the workplace. This could be useful to evaluate the continued relevance of the corporate manslaughter legislation.

10.8 Summary

In summary, this chapter has provided a review of the research objectives and presented how they were achieved. The conclusion that can be drawn from this research is that overall, SMEs in the construction industry implement an acceptable health and safety management system. It was evidenced that they are also aware of their main duties of care to their employees. The fact that they account for the vast majority of accidents might be linked to the effectiveness of the actions taken. Despite the moderate influence of the potential consequences of being prosecuted for breaching the H&S regulation, the study revealed that the Corporate Manslaughter and Corporate Homicide Act is yet to bring significant change in the H&S performance of the construction industry.

It is therefore recommended that organisations devote resources to orientate and motivate their senior level to improve their H&S management systems. Moreover, it is important to monitor their H&S practice, thus it would be possible to identify the potential areas for improvements. Lastly, it has been recommended that SMEs express their views on their perceived flaws of the Corporate Manslaughter and Corporate Homicide Act, which can guide the authorities to acknowledge further improvements to this Act.

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Appendices

Appendix A - Preliminary survey questionnaire

Section A – Type of Organisation

Please indicate your position and the following details of your organisation:

1. Job title (position) in the organisation.

☐ Project Manager ☐ H&S Manager ☐ Site Manager
☐ Company Director/Owner ☐ Other (Please specify): ____________________

2. How many years of experience do you have managing H&S?

☐ Less than 5 years ☐ 5 - 10 years ☐ More than 10 years

3. Number of employees within the organisation.

☐ Less than 10 ☐ 10 - 49 ☐ 50 - 249 ☐ More than 250

4. Annual turnover of the organisation.

☐ £632k or less ☐ £633k - £10.2m ☐ £10.3m - £36m ☐ More than £36m

5. Type of construction organisation.

☐ General Contractor ☐ Design Build Contractor ☐ Specialist Contractor
☐ Construction Management ☐ Other (Please specify): ____________________

6. Which of the following represents your main area of work?

☐ Residential Building ☐ Civil Engineering ☐ Repair and Maintenance
☐ Non-Residential Building ☐ Other (Please specify): ____________________

7. Years in operation in the construction industry.

☐ 0 – 5 years ☐ 5 – 10 years ☐ 10 – 15 years ☐ More than 15 years

8. Which of the following represents your main region of work?

☐ England ☐ Scotland ☐ Wales
☐ Northern Ireland ☐ Other (Please specify): ____________________

Please read each statement and tick **[✓]** the column that best describes your judgement of how Micro, Small and Medium-sized Enterprises (SMEs) are currently managing health and safety (H&S) in the UK construction industry.

Section B – Health and Safety Management within the Organisation

Please indicate the extent to which you agree or disagree that SMEs are currently doing the following:	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1. Have a formal H&S policy	☐	☐	☐	☐	☐
2. Design a H&S plan for the organisation	☐	☐	☐	☐	☐
3. Ensure legal compliance	☐	☐	☐	☐	☐
4. Prioritise H&S over time, cost and quality	☐	☐	☐	☐	☐
5. Carry out and document risk assessments	☐	☐	☐	☐	☐
6. Have a formal H&S training programme for employees	☐	☐	☐	☐	☐
7. Involve workers and/or employees in H&S matters	☐	☐	☐	☐	☐
8. Designate a H&S supervisory team	☐	☐	☐	☐	☐
9. Seek for external H&S advice	☐	☐	☐	☐	☐
10. Provide adequate resources to ensure a reasonably practicable H&S performance (tools, equipment, specialised skills, infrastructure, technology)	☐	☐	☐	☐	☐
11. Carry out site inspections	☐	☐	☐	☐	☐
12. Report incidents following the regulations (RIDDOR)	☐	☐	☐	☐	☐
13. Document incident data	☐	☐	☐	☐	☐
14. Keep records of the progress of implemented safety programmes (e.g. training, meetings)	☐	☐	☐	☐	☐
15. Investigate the causes of accidents, incidents or near misses	☐	☐	☐	☐	☐
16. Monitor cases of ill health					

	☐	☐	☐	☐	☐
17. Carry out periodic audits of the effectiveness of risk control	☐	☐	☐	☐	☐
18. Analyse the findings of accident investigations and near miss reports and plan remediation actions	☐	☐	☐	☐	☐
19. Revisit the policy documents periodically	☐	☐	☐	☐	☐
20. Consider errors and external experience to revise H&S plan	☐	☐	☐	☐	☐
21. Other (please specify)					

Section C – Employer's Duty of Care

In your experience, please indicate to what extent you agree or disagree that SMEs are carrying out the following duties as employers:	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1. Explain to employees, in an understandable way, how risks are being controlled	☐	☐	☐	☐	☐
2. Explain to employees who is responsible for the identified risks	☐	☐	☐	☐	☐
3. Deduct from employees' salary the provision of safety equipment and protective clothing	☐	☐	☐	☐	☐
4. Charge employees for the cost of H&S training	☐	☐	☐	☐	☐
5. Provide toilets, washing facilities and drinking water	☐	☐	☐	☐	☐
6. Provide adequate first-aid facilities and instructions	☐	☐	☐	☐	☐
7. Have an up-to-date Employer's Liability certificate	☐	☐	☐	☐	☐
8. Display the Health and Safety Law poster	☐	☐	☐	☐	☐

Section D – Employer's Awareness of Further Duties

In your experience, please indicate to what extent you agree or disagree that SMEs are aware of the following:	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1. There is a duty owed as occupier of construction sites	☐	☐	☐	☐	☐
2. There is a duty owed to persons other than employees	☐	☐	☐	☐	☐
3. Other (please specify)					

Section E – Factors Influencing H&S Performance

Please indicate to what extent you agree or disagree that the following factors influence the way SMEs manage health and safety:	Strongly disagree	Disagree	Neither agree or	Agree	Strongly agree
1. The issue of improvement or prohibition notices	☐	☐	☐	☐	☐
2. Previous prosecutions or convictions for a H&S breach	☐	☐	☐	☐	☐
3. The risk of being prosecuted as an individual	☐	☐	☐	☐	☐
4. The fear of imprisonment	☐	☐	☐	☐	☐
5. The risk of being prosecuted for corporate manslaughter	☐	☐	☐	☐	☐
6. The amount of the fines imposed for a corporate manslaughter conviction	☐	☐	☐	☐	☐

7. The possibility of liquidation after a corporate manslaughter conviction	☐	☐	☐	☐	☐
8. The reputation of the organisation	☐	☐	☐	☐	☐
9. Morality	☐	☐	☐	☐	☐
10. Reduction in premiums	☐	☐	☐	☐	☐
11. Other (please specify)					

Section F – The Influence of the Corporate Manslaughter Legislation

Please indicate the extent to which you believe the following have improved among SMEs since the Corporate Manslaughter and Corporate Homicide Act 2007 came into force:	0 = Not Improved 4 = Vastly Improved				
	0	1	2	3	4
1. The management of risks in the workplace	☐	☐	☐	☐	☐
2. The rate of incidents in the organisation	☐	☐	☐	☐	☐
3. Communication between employer and employees	☐	☐	☐	☐	☐
4. The quality of the contents of H&S training	☐	☐	☐	☐	☐
5. The provision of adequate working facilities	☐	☐	☐	☐	☐
6. Compliance with legal requirements	☐	☐	☐	☐	☐
7. Involvement of employees in decision making	☐	☐	☐	☐	☐
8. Level of expertise on H&S	☐	☐	☐	☐	☐
9. Provision of adequate tools and equipment	☐	☐	☐	☐	☐
10. The budget allocated for H&S	☐	☐	☐	☐	☐
11. Quality of site inspections	☐	☐	☐	☐	☐
12. Reporting of accidents, incidents or near misses	☐	☐	☐	☐	☐
13. Commitment to prevention on ill health	☐	☐	☐	☐	☐

	0 = Not Improved 4 = Vastly Improved				
	0	1	2	3	4
14. The level of formality of a H&S plan in the organisation	☐	☐	☐	☐	☐
15. Working days lost due to absence of workers	☐	☐	☐	☐	☐
16. Insurance premiums	☐	☐	☐	☐	☐
17. The understanding of H&S risks within the organisation	☐	☐	☐	☐	☐
18. Employer's behavior towards H&S	☐	☐	☐	☐	☐
19. Morale and pride in working for the organisation	☐	☐	☐	☐	☐
20. Other (please specify)					

Section G – General Information

1. Overall, to what extent has the Corporate Manslaughter and Corporate Homicide Act 2007 influenced the way health and safety is managed in your organisation?

No Influence 0 ☐ 1 ☐ 2 ☐ 3 ☐ 4- Vast Influence ☐

2. Would you be interested in participating in an interview to elaborate on the responses you have given in this questionnaire?

Yes ☐ No ☐

3. Please provide the following information if you answered "Yes" to the previous question.

Company Name	
Name of Respondent	
Address	
Telephone	
Email	

END OF THE QUESTIONNAIRE. THANK YOU!

Appendix B - Calculation of the sampling margin of error

The margin of error is given by the expression:

$$m = z^{*}\sqrt{\frac{p(1-p)}{n}}$$

Where:

m = margin of error

z^{*} = standard random variable

p = estimated variance

n = sample size

For a significance level of α= 0.05, z^{*} = 1.96.

When estimating the margin of error, it was assumed that maximum variance occurs when p = 0.5 which provides the worst case scenario (Sutrisna, 2004).

Based on this assumption, the margin of error was computed as follows:

$m = 1.96\sqrt{\frac{0.5(1-0.5)}{98}}$ x 100%

m = 9.90%

Appendix C – Cover letter for main survey questionnaire

To Whom It May Concern:

Dear Sir/Madam

REQUEST FOR PARTICIPATION IN CONSTRUCTION HEALTH AND SAFETY MANAGEMENT RESEARCH

My name is Mr. Pablo A. Perez, a PhD candidate at the University of Wolverhampton. As your organisation is in the construction industry, I would like to request your participation in my research, which seeks to investigate the way health and safety is being managed by micro, small and medium-sized enterprises (SMEs) in the construction industry and the influence of the legal system.

I would be very grateful if a Director or other senior manager with direct involvement in health and safety management in your organisation can complete the enclosed questionnaire and return it in the self-addressed envelope (no stamp required). The questionnaire can be also completed online following the link provided. The questionnaire will take approximately 15 minutes to complete and your responses will remain confidential and used solely for research purposes. Data from this research will be kept under lock and reported only as a collective combined total. No one other than the researchers will know your individual answers to this questionnaire. If you agree to participate in this project, please answer the questions on the questionnaire as best you can.

This research is being undertaken under the supervision of Professor Issaka Ndekugri and Dr. Nii Ankrah of the University of Wolverhampton. If you require any further information or clarification, I will be happy to answer your questions. My contact details are below.

The research team do appreciate that the questionnaire will take some of the respondent's valuable time. However, without such contribution, the intended input of this research towards improving construction health and safety will not be realised. It is our hope therefore that you will be able to assist in this research.

We are counting on your support.

Yours faithfully,

Pablo A. Perez
Doctoral Researcher
Faculty of Science and Engineering, University of Wolverhampton
Wulfruna Street, Wolverhampton, WV1 1LY
Phone:[redacted] - Email:[redacted]

QUESTIONNAIRE INFORMATION SHEET

This survey is part of a doctoral research investigating the impact of the corporate manslaughter legislation on micro, small and medium-sized enterprises (SMEs) in the construction industry.

The questionnaire is structured in seven sections. **Section A** requests general information about the organisation. **Section B** focuses on the way SMEs are currently managing health and safety. **Section C** and **Section D** focus on the awareness of the health and safety duties of employers. **Section E** examines the factors that influence the way H&S is being managed in SMEs. **Section F** examines the extent to which SMEs have improved H&S management since the enactment of the Corporate Manslaughter and Corporate Homicide Act 2007. Finally, **Section G** requests optional information about yourself and your organisation.

Please answer all questions to the best of your knowledge and judgment. There are no "correct" or "incorrect" answers. Only your opinion as an SME is requested. The questionnaire will take approximately **15 minutes** to complete.

Please return the completed questionnaire using the self-addressed envelope provided (no stamp required). If you have any questions, please contact Mr Pablo A. Perez using the contact information below.

In case you require/prefer to complete the questionnaire online, please type in the following link on your internet browser:

https://goo.gl/hrh8uz

Thank you very much for your time.

Pablo A. Perez
Doctoral Researcher
Faculty of Science and Engineering, University of Wolverhampton
Wulfruna Street, Wolverhampton, WV1 1LY
Phone: [redacted] - Email: [redacted]

Appendix D – Main survey questionnaire

Section A – Type of Organisation

Please indicate your position and the following details of your organisation:

9. Job title (position) in the organisation.

☐ Project Manager ☐ H&S Manager ☐ Site Manager

☐ Company Director/Owner ☐ Other (Please specify): ____________________

10. How many years of experience do you have managing H&S?

☐ Less than 5 years ☐ 5 - 10 years ☐ More than 10 years

11. Number of employees within the organisation.

☐ Less than 10 ☐ 10 - 49 ☐ 50 - 249 ☐ More than 250

12. Annual turnover of the organisation.

☐ £632k or less ☐ £633k - £10.2m ☐ £10.3m - £36m ☐ More than £36m

13. Type of construction organisation.

☐ General Contractor ☐ Design Build Contractor ☐ Specialist Contractor

☐ Construction Management ☐ Other (Please specify): ____________________

14. Which of the following represents your main area of work? ***(Select one option)***

☐ Residential Building ☐ Civil Engineering ☐ Repair and Maintenance

☐ Non-Residential Building ☐ Other (Please specify): ____________________

15. Years in operation of your organisation in the construction industry.

☐ 0 – 5 years ☐ 5 – 10 years ☐ 10 – 15 years ☐ More than 15 years

16. Which of the following represents your main region of work? ***(Select one option)***

☐ England ☐ Scotland ☐ Wales

☐ Northern Ireland ☐ Other (Please specify): ____________________

Please read each statement and tick **[✔]** the column that best describes your judgement of health and safety **(H&S)** practice of Micro, Small and Medium-sized Enterprises **(SMEs)** in the UK construction industry.

Section B – Health and Safety Management within the Organisation

Please indicate the extent to which you agree or disagree that SMEs are currently doing the following:	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1. Have a formal H&S policy	☐	☐	☐	☐	☐
2. Ensure the H&S policy is comprehensive to all	☐	☐	☐	☐	☐
3. Have a defined management structure within the organisation	☐	☐	☐	☐	☐
4. Make sure the H&S policy is implemented	☐	☐	☐	☐	☐
5. Strongly consider H&S in pre-plan/pre-design stages	☐	☐	☐	☐	☐
6. Generate H&S plans for the works to be carried out	☐	☐	☐	☐	☐
7. Do not ensure compliance with the law	☐	☐	☐	☐	☐
8. Seek a fair balance between H&S, time, cost and quality	☐	☐	☐	☐	☐
9. Do not carry out risk assessments for the works	☐	☐	☐	☐	☐
10. Implement a defined procedure to carry out risk assessments	☐	☐	☐	☐	☐
11. Have a formal H&S training programme for employees	☐	☐	☐	☐	☐
12. Do not make efforts to secure trust of employees	☐	☐	☐	☐	☐
13. Ensure high standard welfare conditions	☐	☐	☐	☐	☐
14. Involve workers and/or employees in H&S matters	☐	☐	☐	☐	☐
15. Secure an adequate flow of information within the organisation	☐	☐	☐	☐	☐

16. Designate clear H&S roles and responsibilities	☐	☐	☐	☐	☐
17. Do not assure employees are competent enough to perform the works	☐	☐	☐	☐	☐
18. Seek external H&S advice	☐	☐	☐	☐	☐
19. Provide adequate resources to ensure a reasonably practicable H&S performance (tools, equipment, specialised skills, infrastructure, technology)	☐	☐	☐	☐	☐
20. Do not carry out site inspections	☐	☐	☐	☐	☐
21. Report incidents in compliance with RIDDOR	☐	☐	☐	☐	☐
22. Document incident data	☐	☐	☐	☐	☐
23. Keep records of the progress of implemented safety programmes (e.g. training, meetings)	☐	☐	☐	☐	☐
24. Analyse the causes of accidents, incidents or near misses	☐	☐	☐	☐	☐
25. Monitor cases of ill health	☐	☐	☐	☐	☐
26. Carry out periodic audits of the H&S management system	☐	☐	☐	☐	☐
27. Do not use accidents investigation reports to plan remedial actions	☐	☐	☐	☐	☐
28. Revisit the policy documents periodically	☐	☐	☐	☐	☐
29. Consider errors and external experience to revise H&S plan	☐	☐	☐	☐	☐
30. Ensure lessons learned are put into practice	☐	☐	☐	☐	☐

Please add below any comments you wish to make regarding the way H&S is being managed in Micro, Small and Medium Enterprises (SMEs) in the construction industry:

____

____

____

____

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____

____

Section C – Employer's Duty of Care

In your experience, please indicate to what extent you agree or disagree that SMEs are carrying out the following duties as employers to ensure employee's safety:	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1. Explain to employees, in an understandable way, how risks are being controlled	☐	☐	☐	☐	☐
2. Explain to employees who is responsible for the identified risks	☐	☐	☐	☐	☐
3. Deduct from employees' salary the provision of safety equipment and protective clothing	☐	☐	☐	☐	☐
4. Charge employees for the cost of H&S training	☐	☐	☐	☐	☐
5. Provide toilets, washing facilities and drinking water	☐	☐	☐	☐	☐
6. Provide adequate first-aid facilities and instructions	☐	☐	☐	☐	☐
7. Have an up-to-date Employer's Liability certificate	☐	☐	☐	☐	☐
8. Display the Health and Safety Law poster	☐	☐	☐	☐	☐

Section D – Employer's Awareness of Further Duties

In your experience, please indicate to what extent you agree or disagree that SMEs are aware of the following:	Strongly disagree	Disagree	Neither agree or disagree	Agree	Strongly agree
1. There is a duty owed as occupier of construction sites	☐	☐	☐	☐	☐
2. There is a duty owed to persons other than employees	☐	☐	☐	☐	☐

Section E – Factors Influencing H&S Performance

In the table below is a list of factors related to H&S prosecutions and convictions. Please rate the influence of each factor on the way SMEs manage health and safety:

0 - No influence
1 - Minor influence
2 - Some influence
3 - Moderate influence
4 - Vast influence

	0	1	2	3	4
1. The issue of improvement or prohibition notices	☐	☐	☐	☐	☐
2. Past cases of prosecutions and convictions of other organisations	☐	☐	☐	☐	☐
3. The risk of being prosecuted for corporate manslaughter	☐	☐	☐	☐	☐
4. The risk of being prosecuted as an individual	☐	☐	☐	☐	☐
5. The fear of imprisonment	☐	☐	☐	☐	☐
6. The amount of the fines imposed for a conviction	☐	☐	☐	☐	☐
7. The possibility of liquidation after a corporate manslaughter conviction	☐	☐	☐	☐	☐
8. The risk of being disqualified from holding a position in the organisation	☐	☐	☐	☐	☐
9. The reputation of the organisation	☐	☐	☐	☐	☐
10. Reduction in premiums	☐	☐	☐	☐	☐
11. Morality	☐	☐	☐	☐	☐

Section F – The Influence of the Corporate Manslaughter Legislation

Following the given scale, please indicate the extent to which you believe the following have improved among SMEs since the Corporate Manslaughter and Corporate Homicide Act 2007 came into force:

0 - Not improved
1 - Slightly improved
2 - Somewhat improved
3 - Moderately improved
4 - Vastly improved

	0	1	2	3	4
1. The management of risks in the workplace	☐	☐	☐	☐	☐
2. The rate of incidents in the organisation	☐	☐	☐	☐	☐
3. Communication between employer and employees	☐	☐	☐	☐	☐
4. The quality of the contents of H&S training	☐	☐	☐	☐	☐
5. The provision of adequate working facilities	☐	☐	☐	☐	☐
6. Compliance with legal requirements	☐	☐	☐	☐	☐
7. Involvement of employees in decision making	☐	☐	☐	☐	☐
8. Level of expertise on H&S	☐	☐	☐	☐	☐
9. Provision of adequate tools and equipment	☐	☐	☐	☐	☐
10. The budget allocated for H&S	☐	☐	☐	☐	☐
11. Quality of site inspections	☐	☐	☐	☐	☐
12. Reporting of accidents, incidents or near misses	☐	☐	☐	☐	☐
13. Commitment to prevention on ill health	☐	☐	☐	☐	☐
14. The level of formality of a H&S plan in the organisation	☐	☐	☐	☐	☐
15. Working days lost due to absence of workers	☐	☐	☐	☐	☐
16. Insurance premiums	☐	☐	☐	☐	☐
17. The understanding of H&S risks within the organisation	☐	☐	☐	☐	☐
18. Employer’s behavior towards H&S	☐	☐	☐	☐	☐
19. Morale and pride in working for the organisation	☐	☐	☐	☐	☐

Please add below any comments you wish to make regarding the enactment of the Corporate Manslaughter and Corporate Homicide Act 2007 and its effect in SMEs:

____

____

____

____

____

____

Section G – General Information

4. Overall, to what extent has the Corporate Manslaughter and Corporate Homicide Act 2007 improved the way health and safety is managed in your organisation?

☐ 0 - Not improved
☐ 1 - Slightly improved
☐ 2 - Somewhat improved
☐ 3 - Moderately improved
☐ 4 - Vastly improved

5. Would you be interested in participating in an interview to elaborate on the responses you have given in this questionnaire?

   Yes ☐ No ☐

6. Please provide the following information if you answered "Yes" to the previous question.

Company Name	
Name of Respondent	
Address	
Telephone	
Email	

Appendix E - Reversed statements in questionnaire

Question Code	Statement presented to participants	Reversed statement in the main body of the thesis
Plan 7	Do not ensure compliance with the law	Ensure compliance with the law
Do 9	Do not carry out risk assessments for the work	Carry out risk assessments for the works
Do 12	Do not make efforts to secure trust of employees	Make effort to secure trust of employees
Do 17	Do not assure employees are competent enough to perform the works	Assure employees are competent enough to perform the works
Check 20	Do not carry out sire inspections	Carry out sire inspections
Act 27	Do not use accidents investigation reports to plan remedial actions	Use accidents investigation reports to plan remedial actions
Duty 3	Deduct from employees' salary the provision of safety equipment and protective clothing	Provide safety equipment and protective clothing to employees free of charge
Duty 4	Charge employees for the cost of H&S training	Provide H&S training to the employees free of charge

Appendix F – Missing Values analysis

Missing Values Analysis									
				Missing		No. of Extremes[a]		Estimated Means	
Question	N	Mean	Std. Deviation	Count	Percent	Low	High	All Values	EM
B1	96	4.52	0.740	2	2.0	3	0	4.52	4.53
B2	96	4.32	0.788	2	2.0	3	0	4.32	4.34
B3	96	4.20	0.854	2	2.0	4	0	4.20	4.20
B4	96	4.14	0.947	2	2.0	6	0	4.14	4.15
B5	96	3.98	1.056	2	2.0	0	0	3.98	3.99
B6	96	4.20	0.866	2	2.0	5	0	4.20	4.21
B7	96	4.01	1.147	2	2.0	0	0	4.01	4.03
B8	96	3.53	1.151	2	2.0	7	0	3.53	3.53
B9	96	4.10	1.081	2	2.0	11	0	4.10	4.12
B10	96	3.78	1.088	2	2.0	0	0	3.78	3.80
B11	96	3.74	1.098	2	2.0	0	0	3.74	3.75
B12	96	3.79	1.104	2	2.0	0	0	3.79	3.79
B13	96	3.80	1.082	2	2.0	0	0	3.80	3.82
B14	96	3.70	1.097	2	2.0	0	0	3.70	3.71
B15	96	3.81	0.966	2	2.0	0	0	3.81	3.83
B16	96	3.91	0.895	2	2.0	0	0	3.91	3.92
B17	96	3.96	1.151	2	2.0	0	0	3.96	3.97
B18	96	3.96	0.962	2	2.0	9	0	3.96	3.97
B19	96	4.02	0.906	2	2.0	6	0	4.02	4.04
B20	96	4.06	1.141	2	2.0	12	0	4.06	4.08
B21	96	4.14	0.969	2	2.0	10	0	4.14	4.14
B22	96	3.86	1.022	2	2.0	0	0	3.86	3.89
B23	96	3.75	1.066	2	2.0	0	0	3.75	3.77
B24	96	3.79	1.160	2	2.0	0	0	3.79	3.80
B25	96	3.42	1.185	2	2.0	0	0	3.42	3.43
B26	96	3.67	1.158	2	2.0	0	0	3.67	3.69
B27	96	3.82	1.105	2	2.0	0	0	3.82	3.83
B28	96	3.86	1.032	2	2.0	0	0	3.86	3.88
B29	96	3.80	1.001	2	2.0	0	0	3.80	3.81
B30	96	4.08	0.948	2	2.0	9	0	4.08	4.10
C1	95	3.96	0.874	3	3.1	8	0	3.96	3.92
C2	94	3.95	0.920	4	4.1	9	0	3.95	3.92
C3	95	4.41	0.765	3	3.1	2	0	4.41	4.39

C4	95	4.32	0.878	3	3.1	3	0	4.32	4.30
C5	95	4.25	0.956	3	3.1	8	0	4.25	4.23
C6	95	4.20	0.963	3	3.1	8	0	4.20	4.18
C7	95	4.56	0.680	3	3.1	1	0	4.56	4.54
C8	95	4.34	0.846	3	3.1	4	0	4.34	4.32
D1	94	4.17	0.851	4	4.1	5	0	4.17	4.13
D2	94	4.21	0.890	4	4.1	5	0	4.21	4.17
E1	95	3.23	0.928	3	3.1	4	0	3.23	3.21
E2	95	2.60	1.004	3	3.1	2	0	2.60	2.59
E3	95	3.17	1.117	3	3.1	10	0	3.17	3.15
E4	95	3.16	1.151	3	3.1	13	0	3.16	3.15
E5	95	3.07	1.169	3	3.1	0	0	3.07	3.05
E6	95	3.03	1.056	3	3.1	0	0	3.03	3.03
E7	95	3.05	1.143	3	3.1	0	0	3.05	3.01
E8	94	2.77	1.248	4	4.1	0	0	2.77	2.71
E9	95	3.25	0.978	3	3.1	8	0	3.25	3.22
E10	92	2.58	1.151	6	6.1	0	0	2.58	2.53
E11	94	3.02	1.136	4	4.1	0	0	3.02	2.96
F1	95	2.60	1.215	3	3.1	0	0	2.60	2.56
F2	95	2.22	1.273	3	3.1	0	0	2.22	2.17
F3	95	2.31	1.238	3	3.1	0	0	2.31	2.28
F4	95	2.51	1.219	3	3.1	8	0	2.51	2.48
F5	95	2.36	1.211	3	3.1	0	0	2.36	2.33
F6	95	2.57	1.155	3	3.1	5	0	2.57	2.54
F7	95	1.88	1.254	3	3.1	0	0	1.88	1.86
F8	95	2.42	1.234	3	3.1	0	0	2.42	2.40
F9	95	2.24	1.209	3	3.1	0	0	2.24	2.25
F10	95	2.01	1.242	3	3.1	0	0	2.01	2.00
F11	95	2.26	1.240	3	3.1	0	0	2.26	2.26
F12	95	2.33	1.324	3	3.1	0	0	2.33	2.28
F13	95	2.12	1.262	3	3.1	0	0	2.12	2.08
F14	95	2.35	1.218	3	3.1	0	0	2.35	2.33
F15	95	1.62	1.281	3	3.1	0	0	1.62	1.57
F16	95	1.21	1.193	3	3.1	0	0	1.21	1.17
F17	94	2.35	1.250	4	4.1	0	0	2.35	2.35
F18	94	2.28	1.222	4	4.1	0	0	2.28	2.25
F19	95	2.02	1.271	3	3.1	0	0	2.02	1.99

Appendix G – Mann-Whitney and Kruskal-Wallis

Kruskal Wallis test

Job Title

Ranks

	Job Title	N	Mean Rank
VAR1	Project Manager	4	48.88
	H&S Manager	29	53.97
	Company Director/Owner	56	45.61
	Other	7	48.79
	Total	96	
VAR2	Project Manager	4	27.88
	H&S Manager	29	59.16
	Company Director/Owner	56	43.98
	Other	7	52.29
	Total	96	
VAR3	Project Manager	4	34.50
	H&S Manager	29	50.72
	Company Director/Owner	56	49.34
	Other	7	40.57
	Total	96	
VAR4	Project Manager	4	50.50
	H&S Manager	29	54.03
	Company Director/Owner	56	45.57
	Other	7	47.86
	Total	96	

Test Statistics[a,b]

	VAR1	VAR2	VAR3	VAR4
Chi-Square	1.723	8.085	1.819	1.789
df	3	3	3	3
Asymp. Sig.	.632	.055	.611	.617

a. Kruskal Wallis Test

b. Grouping Variable: Job Title

Years of experience managing H&S

Ranks

	Yrs Experience	N	Mean Rank
VAR1	Less than 5	11	57.95
	5-10 years	19	51.26
	More than 10	66	46.13
	Total	96	
VAR2	Less than 5	11	57.23
	5-10 years	19	46.76
	More than 10	66	47.55
	Total	96	
VAR3	Less than 5	11	44.41
	5-10 years	19	53.24
	More than 10	66	47.82
	Total	96	
VAR4	Less than 5	11	58.77
	5-10 years	19	49.89
	More than 10	66	46.39
	Total	96	

Test Statistics[a,b]

	VAR1	VAR2	VAR3	VAR4
Chi-Square	1.933	1.238	.829	1.925
df	2	2	2	2
Asymp. Sig.	.380	.538	.661	.382

a. Kruskal Wallis Test

b. Grouping Variable: Yrs Experience

Number of employees

Ranks

	Employees	N	Mean Rank
VAR1	Less than 10	22	48.36
	10-49	34	50.06
	50-249	36	49.31
	More than 250	4	28.75
	Total	96	
VAR2	Less than 10	22	47.80
	10-49	34	50.12
	50-249	36	49.82
	More than 250	4	26.75
	Total	96	
VAR3	Less than 10	22	50.50
	10-49	34	50.96
	50-249	36	47.24
	More than 250	4	28.00
	Total	96	
VAR4	Less than 10	22	43.86
	10-49	34	51.93
	50-249	36	50.82
	More than 250	4	24.00
	Total	96	

Test Statistics[a,b]

	VAR1	VAR2	VAR3	VAR4
Chi-Square	2.149	2.663	2.626	4.471
df	3	3	3	3
Asymp. Sig.	.542	.446	.453	.215

a. Kruskal Wallis Test

b. Grouping Variable: Employees

Ranks

	Turnover	N	Mean Rank
VAR1	632k or less	11	42.50
	633k-10.2m	53	48.11
	10.3m-36m	27	56.46
	More than 36m	5	22.80
	Total	96	
VAR2	632k or less	11	31.09
	633k-10.2m	53	48.04
	10.3m-36m	27	59.52
	More than 36m	5	32.20
	Total	96	
VAR3	632k or less	11	47.41
	633k-10.2m	53	48.46
	10.3m-36m	27	53.06
	More than 36m	5	26.70
	Total	96	
VAR4	632k or less	11	40.00
	633k-10.2m	53	48.71
	10.3m-36m	27	56.50
	More than 36m	5	21.80
	Total	96	

Test Statistics[a,b]

	VAR1	VAR2	VAR3	VAR4
Chi-Square	6.986	10.307	3.813	7.854
df	3	3	3	3
Asymp. Sig.	.072	.016	.282	.049

a. Kruskal Wallis Test

b. Grouping Variable: Turnover

Type of construction organisation

Ranks

	Type Organisation	N	Mean Rank
VAR1	General Contractor	50	51.84
	Design Build	7	41.00
	Specialist Contractor	37	46.31
	Construction Management	2	31.75
	Total	96	
VAR2	General Contractor	50	51.35
	Design Build	7	38.86
	Specialist Contractor	37	46.86
	Construction Management	2	41.25
	Total	96	
VAR3	General Contractor	50	53.40
	Design Build	7	29.07
	Specialist Contractor	37	45.51
	Construction Management	2	49.25
	Total	96	
VAR4	General Contractor	50	50.92
	Design Build	7	22.79
	Specialist Contractor	37	50.65
	Construction Management	2	38.25
	Total	96	

Test Statistics[a,b]

	VAR1	VAR2	VAR3	VAR4
Chi-Square	2.179	1.635	5.395	6.839
df	3	3	3	3
Asymp. Sig.	.536	.652	.145	.077

a. Kruskal Wallis Test

b. Grouping Variable: Type Organisation

Main area of work

Ranks

	Area Work	N	Mean Rank
VAR1	Residential Building	27	38.83
	Civil Engineering	8	49.50
	Rapair and Maintenance	34	58.94
	Non-Residential Buildings	18	41.78
	Other	9	50.61
	Total	96	
VAR2	Residential Building	27	40.35
	Civil Engineering	8	54.00
	Rapair and Maintenance	34	54.35
	Non-Residential Buildings	18	45.00
	Other	9	52.94
	Total	96	
VAR3	Residential Building	27	42.70
	Civil Engineering	8	55.50
	Rapair and Maintenance	34	55.06
	Non-Residential Buildings	18	45.28
	Other	9	41.33
	Total	96	
VAR4	Residential Building	27	40.59
	Civil Engineering	8	53.81
	Rapair and Maintenance	34	53.75
	Non-Residential Buildings	18	46.83
	Other	9	51.00
	Total	96	

Test Statistics[a,b]

	VAR1	VAR2	VAR3	VAR4
Chi-Square	9.143	4.663	4.409	3.814
df	4	4	4	4
Asymp. Sig.	.058	.324	.353	.432

a. Kruskal Wallis Test

b. Grouping Variable: Area Work

Years of operation of the organisation

Ranks

	Years in Operation	N	Mean Rank
VAR1	5-10 yrs	6	44.75
	10-15 yrs	12	48.04
	More than 15	77	48.25
	Total	95	
VAR2	5-10 yrs	6	54.17
	10-15 yrs	12	51.25
	More than 15	77	47.01
	Total	95	
VAR3	5-10 yrs	6	63.75
	10-15 yrs	12	39.92
	More than 15	77	48.03
	Total	95	
VAR4	5-10 yrs	6	57.08
	10-15 yrs	12	45.38
	More than 15	77	47.70
	Total	95	

Test Statistics[a,b]

	VAR1	VAR2	VAR3	VAR4
Chi-Square	.090	.569	3.000	.770
df	2	2	2	2
Asymp. Sig.	.956	.752	.223	.680

a. Kruskal Wallis Test

b. Grouping Variable: Years in Operation

Region of work

Ranks

	Region Work	N	Mean Rank
VAR1	England	81	49.46
	Scotland	4	36.88
	Wales	3	33.50
	NI	1	60.50
	Other	7	48.79
	Total	96	
VAR2	England	81	49.03
	Scotland	4	31.75
	Wales	3	48.17
	NI	1	41.00
	Other	7	53.14
	Total	96	
VAR3	England	81	49.67
	Scotland	4	28.38
	Wales	3	30.00
	NI	1	57.00
	Other	7	53.14
	Total	96	
VAR4	England	81	48.12
	Scotland	4	42.88
	Wales	3	33.33
	NI	1	78.50
	Other	7	58.36
	Total	96	

Test Statistics[a,b]

	VAR1	VAR2	VAR3	VAR4
Chi-Square	1.849	1.753	3.854	3.107
df	4	4	4	4
Asymp. Sig.	.763	.781	.426	.540

a. Kruskal Wallis Test

b. Grouping Variable: Region Work

Mann-Whitney U test

Turnover

Micro vs Small

Ranks

	Turnover	N	Mean Rank	Sum of Ranks
VAR2	632k or less	11	22.95	252.50
	633k-10.2m	53	34.48	1827.50
	Total	64		

Test Statistics[a]

	VAR2
Mann-Whitney U	186.500
Wilcoxon W	252.500
Z	-1.874
Asymp. Sig. (2-tailed)	.061

a. Grouping Variable: Turnover

Micro vs Medium

Ranks

	Turnover	N	Mean Rank	Sum of Ranks
VAR2	632k or less	11	14.14	155.50
	10.3m-36m	32	24.70	790.50
	Total	43		

Test Statistics[a]

	VAR2
Mann-Whitney U	89.500
Wilcoxon W	155.500
Z	-2.417
Asymp. Sig. (2-tailed)	.016
Exact Sig. [2*(1-tailed Sig.)]	.014[b]

a. Grouping Variable: Turnover

b. Not corrected for ties.

Small vs Medium

Ranks

	Turnover	N	Mean Rank	Sum of Ranks
VAR2	633k-10.2m	53	40.56	2149.50
	10.3m-36m	32	47.05	1505.50
	Total	85		

Test Statistics[a]

	VAR2
Mann-Whitney U	718.500
Wilcoxon W	2149.500
Z	-1.178
Asymp. Sig. (2-tailed)	.239

a. Grouping Variable: Turnover

Appendix H – Invitation to participate in interview

Good afternoon,

My name is Mr Pablo A. Perez, a PhD candidate at the University of Wolverhampton. As your organisation is in the construction industry, I would like to request your **participation in Construction Health and Safety Management research**. This research aims to investigate the way health and safety is currently being managed by SMEs and the influence of the corporate manslaughter legislation. The Corporate Manslaughter and Corporate Homicide Act came into force in 2008, and its effect has become a common concern among solicitors, researchers and organisations. We hope that this study will help to evaluate whether the Act has improved H&S management in construction SMEs, which seem to be the type of organisations at most risk of being prosecuted for the offence.

We are seeking the participation of directors or other senior managers with direct involvement in health and safety management to contribute to this research by way of participating in the 2nd phase of **interviews**. We believe you are in an ideal position to provide us with valuable first-hand information from your perspective regarding this common issue the industry is trying to overcome. The interview would take approximately **25-30 minutes** in length and take place over your preference of a **Skype or Telephone call**. With your permission, the conversation would be voice-recorded to facilitate the collection of information, and later transcribed for analysis. The interview is confidential, and your name would not appear in any thesis or report resulting from this study. Also, you may decline to answer any of the questions or decide to withdraw from this study at any time without any negative consequences if you so wish.

Interviews would take place at your earliest convenience. If you are willing to participate, please **suggest a day and time** that suits you. If you have any questions or would like additional information, please contact me using my contact details below.

Counting on your consideration and support.

Yours faithfully,

Pablo A. Perez
Doctoral Researcher
Faculty of Science and Engineering, University of Wolverhampton
Wulfruna Street, Wolverhampton, WV1 1LY
Phone: [redacted] - Email: [redacted]

Appendix I – Interview Schedule

Part 1

1. Provide a brief profile: current position within your organisation, type of organisation, size and your years of experience managing H&S.

Part 2

1. In general, how do you perceive SMEs are managing H&S in the construction industry?
2. What does your organisation do to manage H&S?
3. Would you say that SMEs implement a well-developed H&S management system?
4. What are some of the challenges SMEs encounter when managing H&S?
5. Among SMEs, would you say that the H&S performance depends on the type of company? E.g. Size, turnover, type of construction organisation, type of work.
6. What things can be improved in the management of H&S among SMEs?
7. From your perspective, would you say that the authorities (HSE) have some responsibility in how H&S is managed in the organisations?

Part 3

1. The study determined that SMEs are aware of their H&S duties of care as an employer to their employees. In your views, what means are used to raise this awareness?
2. Considering the potential consequences of being prosecuted and convicted for a H&S offence, would you say that the financial punishment is the most adequate approach to enhance a good H&S performance?
3. Could you identify any other factors that drive SMEs to manage H&S properly?
4. Although there is evidence of improvement in H&S management, the study also found that insurance premiums have not lowered. Why is a relationship not apparent?
5. There is general agreement that the enactment of Corporate Manslaughter and Corporate Homicide Act has made some improvement in the way H&S is being managed. Would you consider that this Act marked the dawn of a new era in H&S?
6. Based on the new Sentencing Guidelines (2016), would you consider that the equivalent consequences after being convicted under the HSWA could make the corporate manslaughter legislation impractical?
7. Do you think that the CMCHA has the potential to punish large organisations? Why?

Appendix J – Ethical Approval Evidence

Category: A1

Decision: Approved 11/08/2017 Prof Mike Fullen

From: Parson, Pierre-Lloyd [redacted]
Sent: 14 August 2017 10:09
To: Perez Jimenez, Pablo A. [redacted]
Cc: Ndekugri, Issaka E. [redacted]
Subject: Ethical Approval - Pablo Perez Jimenez

Hi Pablo,
Please take this email as official notification that your ethics form (attached) has been approved.

Kind regards,
Pierre – Lloyd Parson
Research Administrator
Faculty of Science & Engineering (MI310)
University of Wolverhampton, City Campus (Wulfruna), Wulfruna Street, Wolverhampton, WV1 1LY
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